THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1353.] LONDON, APRIL 16, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Warranted Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

TORBAY & DART PAINT Co., Ld.,

23, Gt. George St., Westminster, S.W.

DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,

STOCKTON-ON-TEES

Manufacturing Gas Engineers.

See Advertisement, p. 640.

CEMENT

EARLE'S

BEST

PORTLAND CEMENT

MANUFACTURED BY

GEO. & THOS. EARLE,

HULL.

PROMPT DESPATCH:

Seven Jetties on the River.

Two Private Railway Sidings.

FACILITIES FOR DESPATCH:

Six Railway-Waggon Entrances with Steam and Hydraulic Cranes.

Four Rail-y Entrances.

Three different Railway Companies within easy cartage distance.

Storage Capacity 8000 tons.

Office: 7, PIER STREET.

Works: WILMINGTON.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

"Abyssinian" Tube Wells.

Pure Water Supplies

LE GRAND & SUTCLIFF, 100, BUNHILL ROW, LONDON.

R. DEMPSTER & SONS, LTD.,

GAS, CHEMICAL, & HYDRAULIC ENGINEERS & CONTRACTORS,

ELLAND, YORKS.,

Makers of **Reciprocating Pump Exhausters**, and of the **Elland Rotary Exhauster**, which cannot be surpassed for efficiency or superiority of workmanship.

Of the **Two Sets** fixed at **Wigan**, each of which passes 80,000 cubic feet of Gas per hour, **Alderman James Smith** says:

"Your Exhausters have given us the most complete satisfaction, and are well made and highly finished."

Mr. Timmins, Engineer, says:

"The results I have attained with your Exhausters are most satisfactory. I have a perfect gauge; they work noiselessly; and the workmanship and material are excellent throughout."

GASHOLDERS of any size, **SCRUBBERS, CONDENSERS, PURIFIERS, RETORT-FITTINGS,** and every description of **GAS** and **CHEMICAL PLANT.**

Makers of **LIVESEY'S PATENT WASHERS** (for the Colonies and Abroad).

ESTIMATES, PRICES, AND FULL PARTICULARS ON APPLICATION.

NOTE THE ADDRESS— **ELLAND, YORKS.**

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

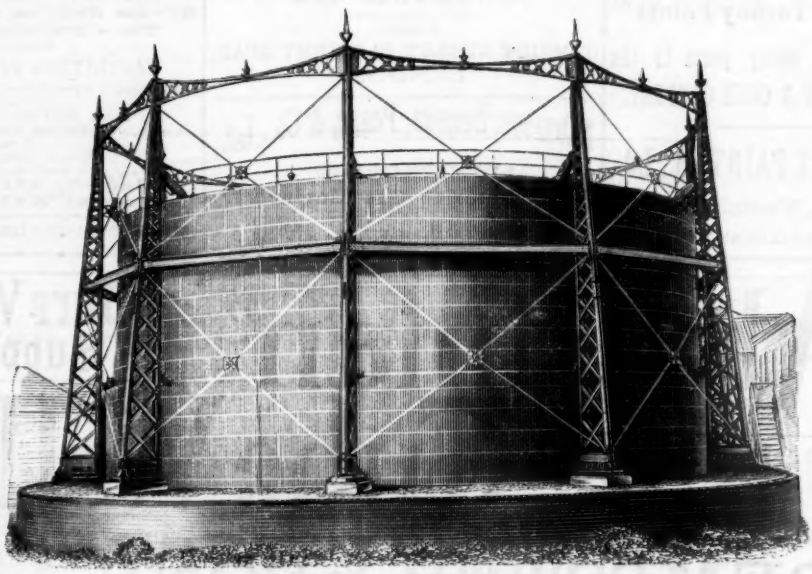
TELEGRAPHIC ADDRESS: "COCKEYS FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers, Ironfounders, & Contractors,

Manufacturers of *GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.*



Manufacturers of *PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BEAKERS.*

SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE AND OTHERS.

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MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO.,

(ESTABLISHED 1822)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

GAS APPARATUS

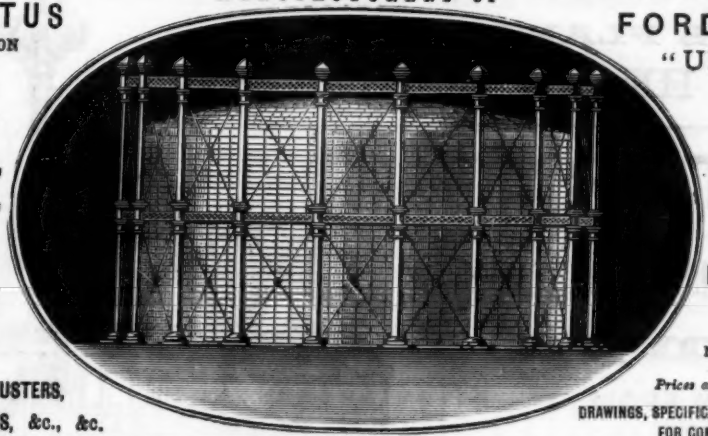
OF EVERY DESCRIPTION

INCLUDING

GASHOLDERS and Tanks, Retorts, Purifiers, Valves, Scrubbers, Condensers,

ETC., ETC.

All of the most approved Designs.



FORD'S PATENT "UNIVERSAL" SCRUBBER-WASHER.

Numbers at work, giving excellent results.

No Motive Power Required.

ALSO OF

SOMERVILLE'S PATENT

RETORT MOUTHPIECES

AND

SELF-SEALING LIDS.

NO LUTING REQUIRED.

Prices and Particulars on application.

BOILERS, ENGINES, PUMPS, BEALE'S and other EXHAUSTERS, METERS, GAUGES, GOVERNORS, &c., &c.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES PREPARED FOR COMPLETE GAS PLANT.

London Offices: 14, GREAT ST. THOMAS APOSTLE, E.C.—J. E. & S. SPENCER, Agents

ESTABLISHED 1825.

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MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,

WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

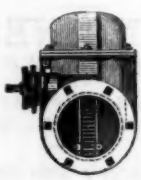
RETORT-BED FITTINGS, AND RETORT-HOUSE APPLIANCES of every description.

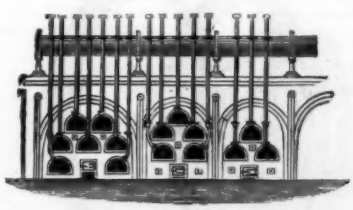
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

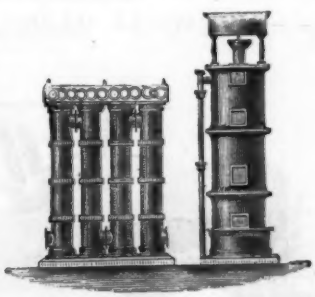
WROUGHT AND CAST IRON **CONDENSERS, SCRUBBERS, & WASHERS**

TAR AND LIQUOR PUMPS, &c.

PATENT **CENTRE VALVES** for working Purifiers. Also Bye-Pass & Stop Valves.





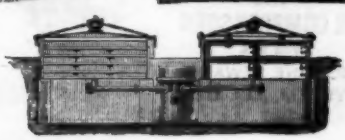


PURIFIERS with Planed Joints.

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

R. & J. DEMPSTER,

ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

GAS PLANT WORKS,

NEWTON HEATH, MANCHESTER.

BATTERY

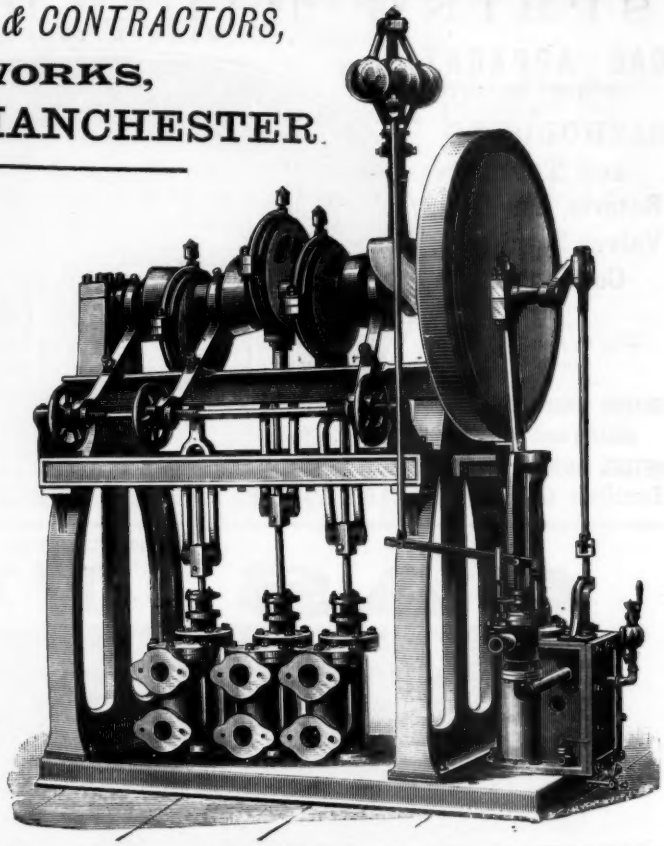
OF

THREE DOUBLE-ACTION

Pumps

DRIVEN FROM

ONE STEAM-ENGINE.



The Pumps are provided with suitable Valves for pumping Ammoniacal Liquor, Tar, and Water; and each is provided with Disengaging Gear, in order that any one can be stopped or started while the Engine is in motion.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

CROSSLEY'S "OTTO" GAS-ENGINE.

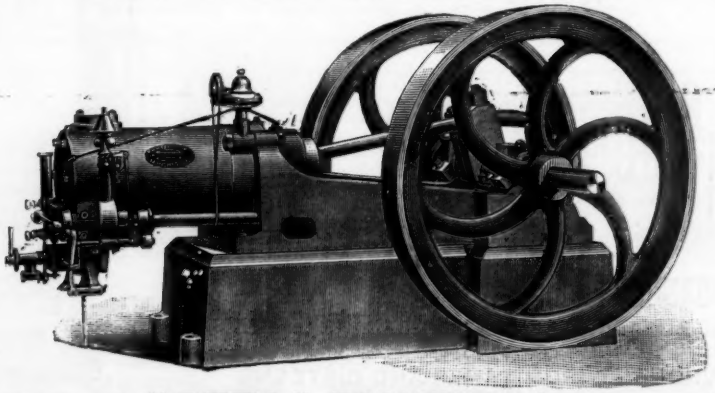
MADE in SIZES
2 Man to 100 HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SCHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

70 Prize Medals.

NEW 14 H.P. NOMINAL SIZE.



MADE in SIZES
2 Man to 100 HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c., &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING.
&c., &c.

Over 27,000 "OTTO" ENGINES have now been made.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

(Mr. SIDNEY HERSEY, Managing Director.—Address at foot.)

351 Patent "Standard" Washer-Scrubbers,

Equal to a Daily Capacity of 306,600,000 Cubic Feet of Gas,

Erected and in course of construction at present date, amongst them being the following, viz.:—

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
,,	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
,,	1,250,000
,,	1,250,000
,,	1,250,000
,,	1,000,000
,,	1,000,000
,,	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
,,	1,000,000
,,	1,000,000
Balmain, N.S.W.	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
,,	1,250,000
,,	750,000
,,	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000 000
Brisbane	1,500,000
,,	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co.	20,000
,,	420,000
Bombay	700,000
Buffalo, U.S.A.	550,000
,,	500,000
Brooklim, U.S.A.	300,000
Bergen	250,000
Berlin	150,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A.	1,000,000
,,	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, U.S.A.	1,500,000
,,	1,500,000
Chicago, U.S.A.	3,000,000
,,	1,000,000
,,	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charottenberg	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
,,	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, ,,	500,000
,, ,,	1,000,000
Düsselldorf	750,000
,,	500,000
Dumfries	250,000
Dunedin, N.Z.	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
,,	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W.	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba	750,000
Hastings	1 500,000
Huddersfield	300,000
,,	750,000
,,	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwike	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A.	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100 000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000

LONDON:—

	Capacity. Cubic feet per day.
The Gaslight and Coke Co.:—	
Beckton	1,250,000
,,	1,250,000
,,	1,250,000
,,	1,250,000
,,	1,250,000
,,	2,500,000
,,	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
,,	1,500,000
,,	1,500,000
,,	1,500,000
,,	2,000,000
,,	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
,,	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
,,	3,000,000
South Metropolitan Co.:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
,,	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
,,	3,000,000
,,	3,000,000
,,	3,000,000
,,	3,000,000
,,	2,000,000
Leominster	150,000
Leiden	560,000
,,	600,000
Liverpool	2,000,000
,,	2,000,000
,,	2,000,000
,,	2,000,000
,,	2,000,000
,,	3,000,000
Lincoln	1,000,000
,,	600,000
Lowell, U.S.A.	1,000,000
Laclede, ,,	1,000,000
Louisville ,,	1,500,000
Long Eaton	500,000
Lille	900,000
,,	450,000
,,	750,000
,,	250,000
,,	250,000
,,	330,000
Luckenwalde	300,000
Liegwitz	250,000
Lincoln, U.S.A.	500,000
Lawrence ,,	300,000
Lynn ,,	1,500,000
Lyons	1,000,000
Maidstone	1,500,000
Marseilles	1,500,000
,,	500,000
Mons	250,000
Malines	1,500,000
Melbourne	1,500,000
,,	1,500,000
,,	1,500,000
,,	1,500,000
,,	2,500,000
Manchester	400,000
Middleton	100,000
Manley, N.S.W.	750,000
Minneapolis, U.S.A.	300,000
Magdeburg	750,000
Memphis, U.S.A.	1,250,000
Nottingham	2,500,000
,,	2,500,000
,,	2,000,000
,,	1,500,000
,,	2,000,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A.	2,000,000
Nice	600,000
Newcastle, N.S.W.	200,000
Numea, ,,	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A.	1,000,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N.S.W.	100,000
Prescot	150,000
Providence, U.S.A.	750,000
,,	750,000
Planen	300,000
,,	300,000
Portsmouth	2,500,000
,,	2,500,000
Pittsburgh, U.S.A.	1,500,000
Portland ,,	560,000
Pawtucket ,,	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A.	250,000
Roxbury, ,,	500,000
Runcorn Soap Co.	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
,,	1,750,000
,,	1,750,000
Smethwick	750,000
Sydney, N.S.W	1,000,000
,,	1,000,000
,,	2,500,000
,,	50,000
,,	50,000
Sunderland	1,500,000
St. Joseph's, U.S.A.	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
,,	1,500,000
St. Louis, U.S.A.	2,000,000
,,	2,000,000
,,	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A.	2,000,000
,,	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A.	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubbs	300,000
Williamsburg, U.S.A.	600,000
,,	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A.	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A.	500,000
Windsor, N.S.W.	100,000
Wolverton	100,000
Wellington, N.Z.	250,000
Whitchurch	175,000
Washington, U.S.A.	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A.	750,000
Yeadon	500,000
Yeovil	250,000

Address: 59 & 60, Palace Chambers, Bridge St., Westminster, London, S.W.

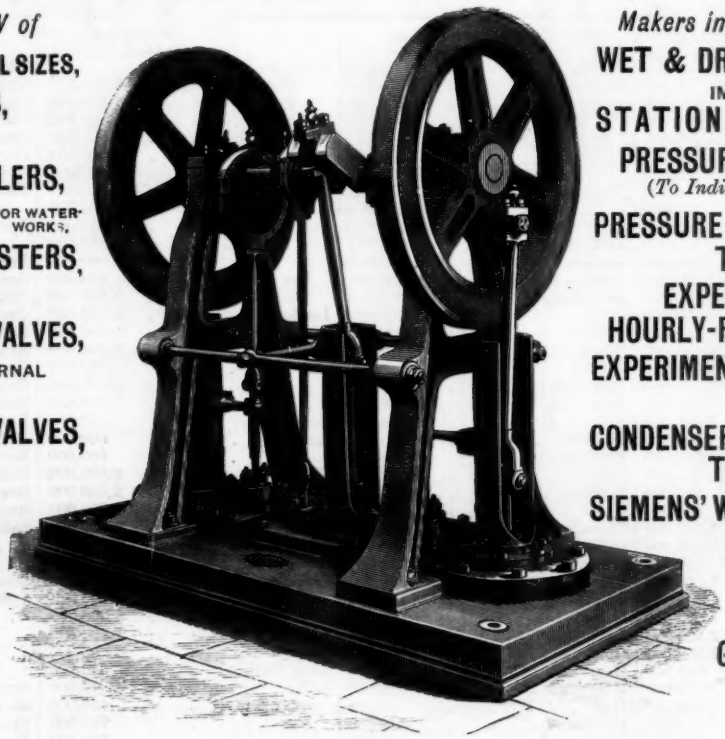
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

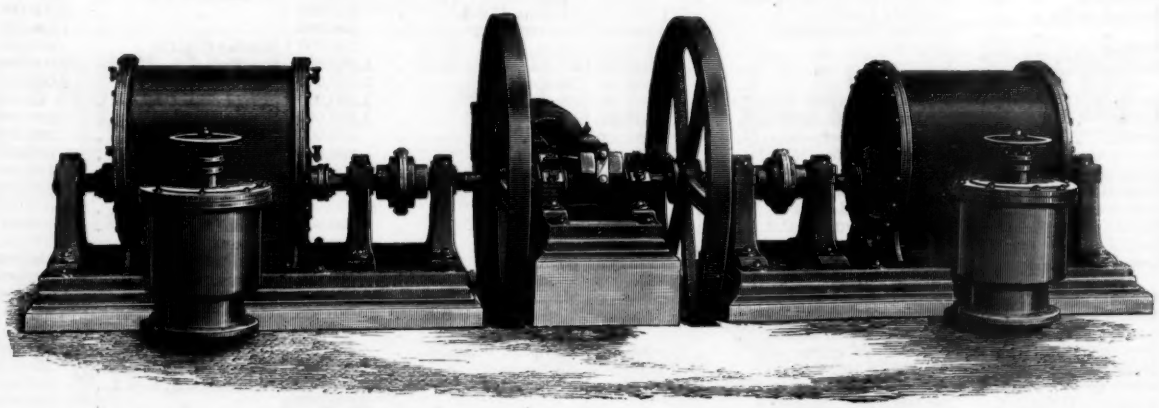
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS (*To Indicate New Time*),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of
GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
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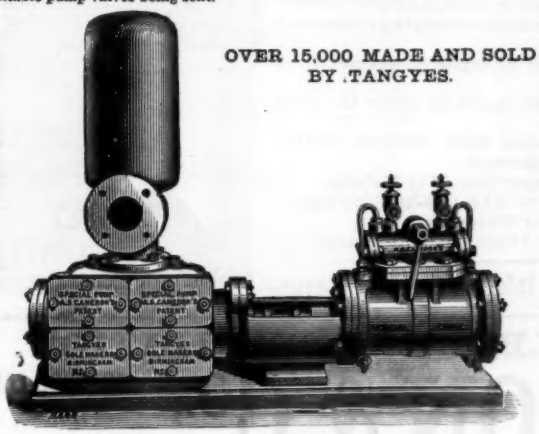

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Diam. Steam Cyl. ins.	3	3	4	4	4	5	5	5	5
Diam. Water Cyl. "	1½	2½	2	3	4	2½	3	4	5
Length Stroke . . "	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.	450	1800	800	1800	3200	1250	1800	3200	5000
Diameter Suction and Delivery . . . ins.	1	2½	1½	2½	2½	2	2½	3	3½
Price . . . . . £	9	12	11	13	15	15	16	19	22

Diam. Steam Cyl. ins.	6	6	6	6	7	7	7	7	7
Diam. Water Cyl. "	3	4	5	6	3	4	5	6	7
Length Stroke. . "	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.	1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery . . . ins.	2½	3	3½	4	2½	3	3½	4	5
Price . . . . . £	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl. ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl. "	4	5	6	7	8	5	6	7	8
Length Stroke . . "	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.	3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery . . . ins.	3	3½	4	5	6	3½	4	5	6
Price . . . . . £	24	27	31	36	43	29	34	39	46

Diam. Steam Cyl. ins.	9	10	10	10	0	10	10
Diam. Water Cyl. "	9	5	6	7	8	9	10
Length Stroke . . "	24	12	12	12	18	24	24
Gals. per hour, approx.	16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery . . . ins.	7	3½	4	5	6	7	8
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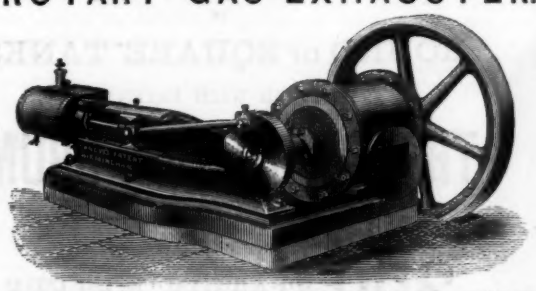

These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

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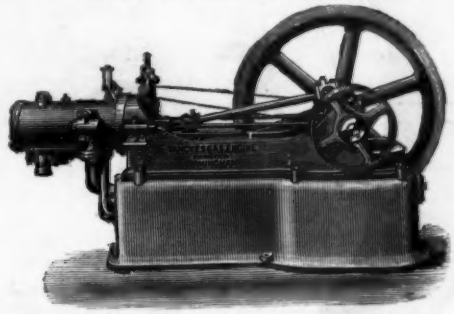

The ½, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	½ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works.

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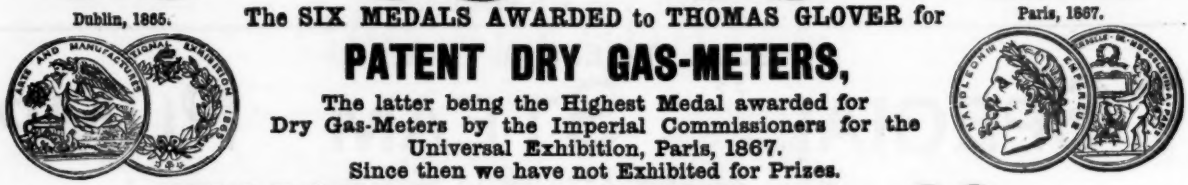

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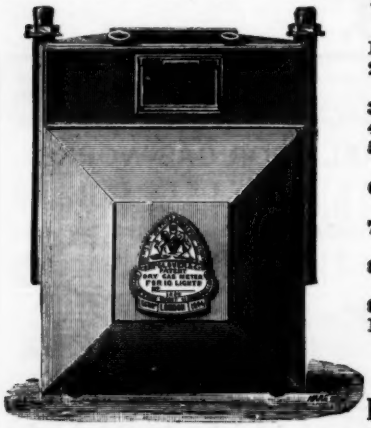

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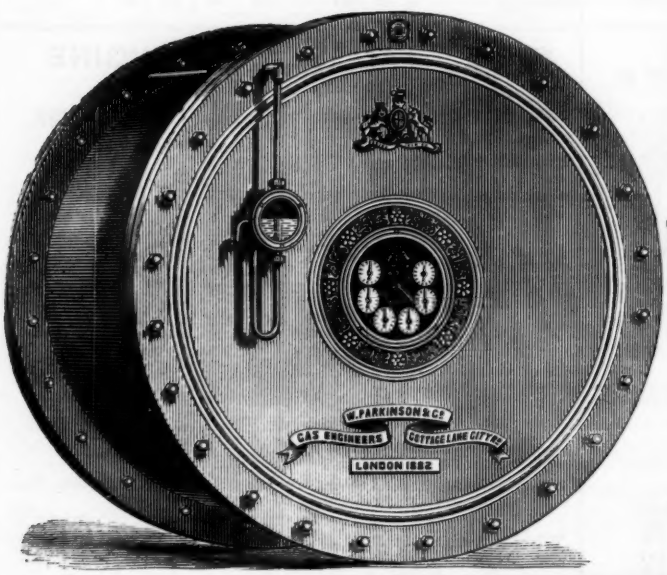

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever of intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 16, 1889.

FOG IN THE CITY, THE HOUSE OF LORDS, AND THE COUNTY COUNCIL.

LAST Wednesday, the City of London was favoured, or rather we should say afflicted, with a very remarkable manifestation of that curious phenomenon, black fog, the nature of which has been repeatedly discussed in these columns. It is almost unprecedented to have such an infliction at this time of the year, when the air is generally in brisk motion; and, moreover, the usual accompaniment of a dense fog—a high barometer—was absent on Wednesday. The barometer was steadily rising; but rain fell all day, increasing towards night. What little wind there was came from the south-east to east. The morning was dull, misty, and what is popularly recognized as heavy; but although the outlook was for some hours decidedly "Novemberish," there was no indication of what was coming. About noon a pall of smoke spread over the town from the eastward; and within a few minutes darkness as of midnight settled on the housetops. For an hour or two the thoroughfares presented a weird aspect. The shops were fully lit up; but there had not been time to light the public lamps, and consequently the streets were even darker than at night. Cabs and carriages bore lighted lamps, and went slowly through the sodden streets—not so slowly, however, as to remove the risk of crossing the roadways for the bewildered foot passengers. Dark as it was, it was still clear enough on the ground level to permit of placards in the lighted shop windows being read across the width of the street; but when the eye was raised towards what should have been the sky, it was like looking up into the vaulted roof of a smoky tunnel. It was impossible to make out the sky-line of even the lowest building; and wherever the shops were interrupted by an unlighted church or blank wall, there was a gap of darkness that might have been the opening of an unfathomable abyss. It was confessed by many observers that never before had they experienced such a total obliteration of light from the sky during the day. So the plague of darkness continued for a long time, ultimately lifting sluggishly before a slight motion of the stagnant air, and permitting oppressed men of business to escape to the damp and misty suburbs, where the smoke pall had not been observed. It had brooded over all central London, however, for hours. Altogether, whether for the extent of area covered by it or for its density, the black fog in the upper air of London on Wednesday last deserves to be recorded as the most remarkable example of its kind ever experienced.

A visitation of this character attracts for the moment the attention of the most incurious sufferer to the gravity of the smoke nuisance. Unfortunately, the feeling that "some-"thing must be done," which manifests itself in newspaper comments upon a London fog when of unusual vileness, is as ephemeral as the occasion that evokes it. This time the "new journalism" which pretends to be so vastly superior to the old, distinguished itself by a declaration as to what must be done by the "new democracy" with that old offender, London fog. An evening paper boldly observed that "when "it comes to four hours' pitch darkness over the greater part "of London in the middle of April, the fog nuisance may be "looked on as claiming 'urgency.'" Then we are told: "It is "purely a matter of fires. The dense pall which yesterday "shut out daylight from London throughout what is, chrono-"logically speaking, the middle of the day, may be seen form-"ing slowly and remorselessly as the fires are lit in the City "offices and warehouses. All we have to do is first to show "the people how they can consume their own smoke (or "warm themselves without coal fires); and, secondly, to "make them do it." Just so; that is all. It is something to be thankful for that the problem is stated in this order by our peremptory autocrats of the Popular Press. They might as easily have laid it down that the right method of procedure is first to pass a law making a smoky chimney a piece of felony, and then leave the path of obedience to be found out afterwards. As it is, if the reform so lightly described is confided to the County Council to carry out in the order specified, we need not fear the speedy advent of the compulsory legislation which is to dear to the exponents of freedom in modern communities. Mr. Wren has a notice on the paper for a motion on this subject at to-day's meeting of the Council; but it will probably come to nothing.

Wednesday's fog was a fit prelude to the discussion, in the House of Lords, on Lord Stratheden and Campbell's Bill for the abatement of smoke in the Metropolis, which took place on the following afternoon. This measure contemplates the extension of the provisions of the Smoke Prevention Acts to private houses; and this was the cause of its rejection last year. The noble Lord who has essayed the task of purifying the air of the Metropolis seems to be incapable of perceiving the difficulties which stand in the way of legislating upon chimneys of private houses; but the Lord Chancellor, while assenting to the proposal of the Government to refer the Bill to Committee, gave plain notice of his intention to move its rejection upon third reading unless this impracticable provision is taken out of it. The way of legislation in this matter is undoubtedly hard. The Government evidently hope that something useful may be made of Lord Stratheden and Campbell's Bill in Committee; but this will imply sacrificing the idea of meddling with private houses. On the other hand, as Lord Meath remarked, until private houses can be dealt with in some way, the smoke nuisance

in London will never be got rid of. This is, of course, the dilemma of smoke abatement. Something may possibly be done to strengthen the law which aims at preventing the fouling of the atmosphere with smoke by manufacturers and others who require to burn fuel for trade purposes. But householders must warm themselves with the national fuel; and a smokeless grate, available for rich and poor, has to be discovered. Legislators have to content themselves accordingly with dealing with the fringe of the subject, while the real cause of the evil is beyond their power. However, while the matter is little likely to be finally settled upon the lines of Lord Stratheden and Campbell's Bill, it is just as well that it should be occasionally discussed, and the formation of false views as to the prospects of smoke prevention thereby prevented. Very probably Thursday's debate would not have taken place, or would have been much curtailed, but for Wednesday's fog, which in this respect was therefore not so inopportune as unseasonable.

THE PRECEDENT IN THE WEST HAM BILL.

We give elsewhere the full report of the parliamentary proceedings on the West Ham Bill, mentioned in these columns last week. It will be seen, as pointed out by Mr. W. Livesey in his letter to-day, that the ultimate form of the novel addition to the ordinary clause dealing with the allocation of profits on revenue account is in the following words:—"Provided that such excess in no half year shall exceed the "sum of £2500." It will be understood by the report that, as we put the point, it was the opinion of the Committee that the amount to be carried forward from one half year to another "should not exceed a sum equal to one-half per cent. "dividend on the Company's paid-up shares for the time "being." When the clauses required for carrying out the decision of the Committee came to be settled, it was represented for the Company that the views of the Committee on this point would be better served by adapting the provisions of section 35 of the Gas-Works Clauses Act, 1847, to this sliding-scale Company. The gist of the matter was the determination of the Committee to make the Company apply the sliding scale up to a margin of one-half per cent. The opponents also wanted this, but were disposed to think that their object would be better served by the prescription of a maximum balance of undivided profit, as proposed by the Committee, than by leaving the matter in the discretion of the Directors of the Company, acting under the pressure of a possible application to Quarter Sessions to compel a reduction of price. The Company were not indisposed to accept the principle of the application of the sliding scale being rendered compulsory instead of permissive in their case, provided that the principle was embodied in what they could regard as a reasonable and workable regulation. After all, the opponents have made a blunder in grasping at the letter and overlooking the spirit; and as their reward they have got a clause which is unworkable, and must be revised by mutual consent in the other House. One or two other matters have been similarly muddled in these proceedings. Thus, the opponents had the capital applied for by way of loan reduced in proportion to one-fourth of the share capital instead of the one-third asked for by the Company, which would, of course, have been cheaper. Also, instead of 10 per cent. capital, the new shares are to be issued as 7 per cent. capital—which is dearer under the terms of the sliding scale. Altogether, the Bill as it issues from the House of Commons is a good example of the scrambling way in which the system of regulation of gas undertakings by Private Bill Committees frequently works. It has cost hundreds of pounds of unnecessary outlay to mangle the Bill so wretchedly, whether its provisions as they stand at present are regarded from the point of view of the promoters or the opponents, that some hundreds more must be spent to patch it up into something like workable form; and, after all is done, the resultant Act may be so hopelessly flawed as to break down the very first time it is put to the strain of a lawsuit.

THE LOTHAMMER GAS PROCESS AND OTHERS.

A London newspaper of yesterday week contained a startling announcement of "Gas at One Shilling per Thousand Cubic "Feet," which we read with some curiosity. It appeared, however, that the "gas" in question is that produced by the process already mentioned once or twice in the Journal under the name of Mr. F. J. Lothammer, who introduced it into this country from France shortly after the inflation of the "Law-"rence gas" bubble. This latter, we understand, has burst, after a few knowing ones, who were "in the swim" from the first, have made a little money out of the deal. No more City luncheons for the representatives of the free and independent Press at the expense of the promoters of this scheme! We can refer without shame to the share we had in conferring notoriety upon this preposterous delusion; but could the reporters for *The Times* and the other papers that puffed the process say the same? However, to return to the Lothammer process. This has been knocking about for some months, possibly waiting for the necessary "Syndicate;" but at length, as we are given to understand, the worthy speculators interested in it are in view of the launch of their little Company. Hence the notices in the newspapers. The "gas" is, or was last week, on view in the basement of a building off Lombard Street. It is simply air carburetted by being forced through gasoline; but this is done under pressure—the motive power being an engine supplied by the "gas" itself. When we saw it there was no photometer, no meter, nor measure for the quantity of fluid evaporated. There was an engine, a carburetter, and a number of enclosed gas-burners, all alight, of course; and from this display the intelligent public were invited to form their opinion of the value of the "invention!" Really, seeing repeated attempts of this class to mislead the British public, all in a measure attended with temporary success, one is tempted to ask whether common sense and business principle have fled the City altogether. As a matter of fact, these wretched juggling displays of "processes" are the fruit of the joint-stock system, which is the bane of modern business life. So long as shares can be shuffled and dealt, like cards, and premiums reward the clever manipulator, it does not matter what title the ventures bear. It may be "Lothammer Gas," or it may be "Sheba's Mines"—it is all one to the premium-hunter. We do not expect to stop anybody from dabbling in Lothammer gas or anything else of the kind with a view to earning the "nimble ninepence" in the shape of a premium. We could not prevent the Leeds water gas scheme from going up to a high premium the other day. It is, however, possible to warn intending investors, not gamblers, of the true character of these schemes; and this service we shall continue to perform. All that we have to say of the Lothammer gas process may be set down in a very few words. The apparatus is probably neither better nor worse than any other of the air carburetting machines which have been sold during the last thirty years to imitate coal gas for isolated buildings. So far from making "gas" at 1s. per 1000 cubic feet, it probably costs from eight to ten times as much for the heavy mixture of petroleum vapour and air, which requires considerable pressure behind it to push it along the pipes, and then will only burn in an enclosed or protected burner. As a method of carburetting air, Mr. Lothammer's process may be as good as any other. More we cannot say of it, even on this score; but as a method of making "gas at 1s. per 1000 cubic feet," as advertised in the newspapers, the thing is only to be properly characterized by one word.

THE COUNTY COUNCIL AND THE WHEELBARROW PHOTOMETER.

In another column will be found a report of what passed at the meeting of the London County Council last Tuesday with regard to the proposed legalization of the portable photometer for testing gas in the Metropolitan area. A resolution was moved to the effect that the Sanitary and Special Purposes Committee should be instructed to consider and report on the desirability of steps being taken in this regard; and thereupon a discussion took place, ending in the adoption of the motion by a large majority. Here, for the present, the matter will probably rest. The Council are gaily frolicking in the unfettered youth of their existence, with no experiences to chasten, nor memories to afflict them. They are passing resolutions in the most light-hearted fashion, without care respecting what may be the results of attempting to carry them into effect. By-and-bye, perhaps, when they have settled all things under the sun by the quick and easy process of carrying resolutions, the Council may try to do something; and then they will discover the tight places and soft spots in the road which they are now so industriously paving with good intentions. After their first half-dozen opposed Bills in Parliament, the Council will probably be sadder and wiser in many respects. With regard to this question of the portable photometer, the same remarks apply as were urged when the Metropolitan Board of Works looked fondly on the ingenious wheelbarrow. It does not contain the first essentials of an instrument on which legal proceedings may be based. Either the wheelbarrow

photometer is sufficient for all legal purposes or it is not. If it is, then the existing gas-testing stations are expensive superfluities, and, with all the testing staff, save one or two barrowmen, may be dispensed with. In any event, to propose at this time any great extension of what is known to be an unreliable and unsatisfactory system of gas testing is idle. If the matter were to come before Parliament, it would be the easiest matter to cite all the best gas-testing authorities, even those upon whom the County Council would have to rely for carrying out the extended prescriptions, for the purpose of proving the utter futility of the system which it would be proposed to enlarge in this manner. Is it likely that Parliament would enact anything of the kind in face of the consensus of skilled opinion that would be brought against it? The idea is preposterous. By the way—who is the Mr. J. Burns, who professes to be able, from personal experience, to tell the Council how the Gas Companies cheat the public? What position did he ever hold in a London gas-works that warrants his speaking in the way reported of him?

WATER GAS TO THE FRONT.

The first offspring of the Water Gas Syndicate, to which we referred a fortnight ago, has appeared upon the scene, in the shape of the Yorkshire Water Gas Company, Limited, which was extensively advertised in the daily newspapers on Saturday, and of which the abridged prospectus appears in another part of the Journal to-day. The capital of this venture is placed at the modest sum of £151,000; and the purpose for which the money is required is the securing of licences to work in Yorkshire the water-gas patents the possession of which forms the ostensible basis of the Syndicate already mentioned. The shares of this concern stand at a high premium—the result, of course, of skilful manipulation by masters of this description of finance. The newspapers are engaged to publish paragraphs puffing Mr. Samson Fox's water gas in terms the exuberance of which usually bears an inverse ratio to the competence of the "organ" as an authority on the subjects of gas production and metallurgy. Then all these valuable certificates in favour of water gas and Mr. Samson Fox are collected and advertised in a bewildering array of columns, in which the opinions of the *Admiralty and Horse Guards Gazette*, *Town and Country*, and other shining lights of science and industry, are concentrated for the purpose of dazzling the eyes of the moneyed Briton, and inducing him to rush frantically for a share in the wonderfully lucrative business of introducing Mr. Samson Fox's water gas into Yorkshire and elsewhere. There are plenty of people open to doing a little premium-hunting, and these keep the game afoot. So the world goes round. We notice, by the way, that the success of Mr. Samson Fox's venture has brought another Water Gas Company into the field, under the name of "Stapp's "Water-Gas Patents, Limited," the prospectus of which will also be found elsewhere. There is no reason why forty others of the same kind should not try their luck within the next week or two; and we hope some will make the attempt. The "Stapp's" promoters cite Professor Wanklyn and Mr. Charles Gandon in testimony of the advantages of this process. What the former may say as to water gas competing with coal gas is of no great moment; but although we have not seen the text of Mr. Gandon's report, we do not doubt that he has told the truth in regard to this matter. We do not remember to have seen the name of Stapp before in connection with water-gas making; but very likely the process to which this name has been given is good enough in its way. There is no particular harm in Mr. Gandon's speaking well of water gas within certain limits. He is not the only Gas Engineer who has done so. Mr. H. E. Jones has professed much admiration for water gas—in its place; and so have many others. To argue from the admission that water gas has its uses under certain conditions, to the conclusion that therefore any particular Water Gas Company offer a good investment for money, is, however, a grievous blunder. Doubtless Mr. Samson Fox and his henchmen, Messrs. A. Wilson and Bernard Dawson, can make water gas; and so probably can Mr. Stapp, whoever he may be. So likewise can Mr. Burdett Loomis, Mr. Lowe, and a score of other advertisers of water-gas plant in the American technical journals. In a single recent issue of a publication of this character we have counted eleven different advertisements of rival water-gas systems and plant; and the number might be greatly extended by a very little inquiry. Let them all come over—why not? One has precisely as good a chance as another. How Americans must chuckle over the last British *furore* which elevates a second-hand Yankee device as the most wonderful of novelties, completely forgetful of the fact that the data of water-gas making were worked out in England by a Gas Engineer—Mr. Kirkham—long years before the Americans knew anything about it.

Melbourne Exhibition Awards.—Messrs. T. Fletcher and Co. have obtained the "First Order of Merit" for gas cooking appliances at the Melbourne Exhibition.

Overhead Wires in the Metropolis.—At their meeting last Thursday, the London County Council passed the following resolution:—"That as overhead wires, which are daily on the increase in the Metropolis, are under no control whatever, the local authorities having no legal power to interfere unless acts of obstruction or danger are proved, and as no means exist of identifying or dealing with ownerless wires, it is expedient that all overhead wires should be brought under legislation; that this Council should be constituted the authority for making bye-laws, for the registration, regulation, and inspection all such wires; and that it be accordingly referred to the Highways and Parliamentary Committees to confer and report as to the steps to be taken with this object."

Waverley Association of Gas Managers.—The half-yearly meeting of this Association was held last Thursday at the Royal Hotel, Portobello. Upwards of thirty members were present at the meeting. Mr. J. Smith, the Manager of the Hawick Gas-Works, presided, and addressed the meeting on the construction of gasholders, retort-benches, the setting of retorts, and other matters. Messrs. Robb (Haddington), Vaas (Portobello), Hall (Berwick-on-Tweed), Walker (Portobello), and Thomson (Duns) took part in the subsequent discussion. Mr. W. Robson, of Selkirk, was elected President for next year; and Mr. G. Taylor, of Jedburgh, was re-elected Secretary. The company afterwards dined together—Mr. J. Robb, of Haddington, in the chair.

An Effect of the Halifax Strike.—One of the effects of the recent strike of stokers at the Halifax Gas-Works has been to give a stimulus to the local adoption of the electric light. Before the strike occurred, several schemes for extending electric lighting had been mooted, and had received some attention from a Committee of the Corporation. The temporary failure of the gas supply proved the electricians' opportunity. The few tradesmen who had already adopted the electric light had for the time a great advantage over their rivals in business; and the example they set has been imitated by others. Arc lamps are now fixed outside numerous shops in several of the principal streets; and what a local newspaper describes as "quite a large staff," is at work daily in fixing wires and preparing for new installations. According to the paper already quoted, "the electric light for shop and street purposes has never before been so well tested." It is probable that much of the extension is due to a laudable desire on the part of the shopkeepers, and it may be also of the controllers of electric light patents, to do a little advertising. Whether the light will hold its own against the cheap gas to which Halifax people are accustomed remains to be seen. The real test will come when the novelty has worn off, and the new "fad" no longer serves the purpose of an advertisement.

Madame Alting-Mees on Cookery.—Of the publishing of cookery books there is no end, but there always appears to be room for just one more; and this truth will appear prominently to any reader of the handy little manual by Madame Alting-Mees, the well-known lecturer on cooking by gas, now printed for the author by Messrs. King, Sell, and Railton, Limited. Notwithstanding the host of cookery books that are to be found in every bookseller's shop, all claiming to be "complete," "practical," or "encyclopædic," the anxious learner is always willing to accept plain counsel respecting this important division of household cares. Mme. Alting-Mees has had great success as a lecturer on cookery and essayist on food, and has doubtless been often asked for the recipes for the tasty dishes she has been accustomed to turn out for the instruction of her pupils. She has accordingly been induced to save time and trouble by putting together for the press a collection of hints and recipes, which most experienced cooks may peruse with benefit, and beginners will receive with delighted interest. Mme. Alting-Mees is practical, modern, and thorough. She does not disdain telling how pots and pans should be cleaned as well as used. We cannot vouch for all Mme. Alting-Mees's recipes; but most of them read well, and the resultant *plats* would doubtless eat well. The little book is not faultless, however. It is somewhat scrappy in parts, giving one an impression that the author could tell a great deal more if she chose. The diction, also, in some places, would be all the better for revision; and the book wants an index. For the next edition, however—which should be called for on an early date—these little points may be looked to. It is sufficient for the present to know that the verdict of a lady reader, that "this is a very nice little cookery book," is likely to be endorsed by every housewife who consults it. By the way, as a matter of scientific curiosity, we should like to know Mme. Alting-Mees's authority for stating that "cabbage water contains typhoid germs." That "the sooner and further we get rid of it the better," we are quite willing to allow; but whence comes the typhoid? Perhaps the author may have something instructive to say on this head.

Water and Sanitary Affairs.

The annual report of Dr. Frankland on the Metropolitan Water Supply was issued last week by the Registrar-General. The results shown are in some respects remarkable. It is acknowledged that the past year was, on the whole, unfavourable to the purifying operations of those Companies which derive their supplies from rivers. Yet every sample of river water was clear and bright when drawn from the mains; and there is not a whisper of that ancient terror—the "moving "organism." The report states that this uniform freedom from the slightest turbidity on the part of the river supplies "reflects great credit upon the Companies dealing with this "raw material." There is, in this respect, a striking contrast between the appearance of these supplies in 1868 and in 1888. At the earlier date there were seven occasions when the water was "very turbid," besides nine when it was "turbid," and twenty when "slightly turbid." There was only one instance in 1868 when the water sent out by the Southwark Company was clear and transparent; but the West Middlesex supply had the honourable distinction of being clear on every occasion. Even the Kent water at that date was only clear eight times out of the twelve. The change with regard to the river waters is described as very striking, and as affording the strongest evidence of the improvements which have been made in the methods of purification in recent years; or, as Dr. Frankland prefers to say, "since the attention of the Companies was prominently "directed in these reports to the defects in their storeage "and filtration." It is a little singular that the only sample of turbid water last year was obtained from the Tottenham supply, which has its source in a deep well. The unfavourable influences of the past year are said to show themselves in the analyses of the river supplies in March, November, and December. Although the river waters, even in these three months, were well filtered, and were delivered in a bright and clear condition, it is intimated that the Companies were not able to contend quite successfully with the excessive quantity of organic impurities then present in the raw waters of the Thames and the Lea. But comparative freedom from organic impurity in the Thames water as delivered in London was such that it had only been surpassed twice in the range of twenty-one years. The Lea water had less organic matter than that derived from the Thames, and had rarely been better. The deep-well water contained much less organic matter than the supplies from the rivers. But whatever may be said in the way of comparison, we find Dr. Frankland acknowledging "the high quality" which the river supplies have "now exhibited for several "years past." It is charged against the Thames waters that the "maximum amount" of organic pollution, taking the average for the month of greatest impurity, has been on the increase of late years; and the same is said to be true also of the Lea-derived waters, except that in the latter instance the pollution was less in 1888 than in 1887. But the maximum of organic pollution in the Thames waters in recent times is very much below that of the earlier period. Thus in every instance since 1877 the maximum quantity of organic matter falls below 40 in ten million parts of water, whereas in the ten years 1868-77 there was only one instance in which the maximum did not reach 40 or exceed it. In 1869 the proportion was as high as 60; whereas the maximum last year was 35—a point attained in December. It is curious that the combined nitrogen exhibits, on the whole, a marked increase in all the waters—Thames, Lea, and deep-well—during the last three years. The moderate amount of chlorine shows that on no occasion has brackish or tidal water gained access to the reservoirs. Finally, we may remark that London, with a death-rate of less than 20 in 1000 per annum, compares well with the generality of large towns. The Metropolitan death-rate also has the character of being less for last year than for any year in the record.

The promoters and opponents of the Newcastle and Gateshead Water Bill are alike to be congratulated on the terms of settlement arrived at in Committee of the House of Lords. The contest at one time promised to be of a very arduous character. The demands of the Gateshead Corporation were exacting; and the attitude assumed by the Duke of Northumberland was open to even greater exception. On the other hand, the Corporation of Newcastle showed a marked disposition to be reasonable. The discussion which took place at a recent meeting of that body made it tolerably plain that the Council fully recognized the difficulties which have in the past been faced and overcome by the Company, and their claim to fair and considerate treatment in the present. It is agreeable to find such pleasant relations existing between a Municipal Corporation and a local Water Company; and it would be still pleasanter if, in some other towns (which need not be specified), we could discern a similar readiness to allow to private enterprise its legitimate reward. Mr. Pope, in opening the case for the promoters of the Bill, made a statement which cannot be challenged. It is the plain fact that the Company have, by a judicious expenditure of capital year by year, satisfied the people of Newcastle of the Directors' desire and ability to serve the public well and liberally. As a result, the inhabitants —too wise to be led away by specious clap-trap about public policy—are content that the control of the water supply shall still remain in the hands of those who have hitherto managed it with such efficiency and success. The shareholders, on their part, have no less reason to be content. The holders of the original capital receive their full 10 per cent. Maximum dividends of 8½ per cent. on certain of the shares, and 7 per cent. on the remainder, have also been maintained for some time past. The new capital asked for by the Bill is to be issued at only 5 per cent. This, it is true, reveals a dwindling tendency that must be unpalatable to the older shareholders; but modern precedents could not have encouraged them to hope for anything better. The same remark applies to the inevitable, but always unwelcome, auction clauses. The profit derivable from a preferential allotment of new capital is no longer obtainable by shareholders in water-works undertakings. There is not the slightest likelihood that Lord Morley, the newly-elected Chairman of Committees of the Upper House, will revert to ancient parliamentary practices in this respect. According to the Prime Minister's recently expressed opinion, "stiffness and firmness" must be the leading qualities of the peer who essays to fill the chairmanship with satisfactory results. In his Lordship's view, these qualities are essential, because the Chairman has to deal with a body of men—presumably Parliamentary Agents and Counsel—"who are principally remarkable for the variety "and multiplicity of their ingenious modes of carrying their "objects into effect." Lord Salisbury credits these learned gentlemen with the power of making appeals that would melt any heart ordinarily soft, and the command of a sophistry which would confuse any brain not abnormally clear. Therefore, says Lord Salisbury, the Chairman of Committees must be stern, stiff, and adamantine in character. Probably, however, Parliamentary Agents, Solicitors, and Counsel have already recognized the fact that old times are gone, and old manners in regard to parliamentary draftsmanship considerably modified. Indeed, the Newcastle Water Bill is in itself some evidence of a recognition of altered methods. With regard to the petitions presented against the Bill, it may be observed that the petitioners were too oblivious of a sound principle—viz., that the population of the district which a Company has been formed to supply with water possess the first and strongest claim on the consideration of that Company. Outsiders must not be allowed to prejudice their rights; and it cannot be doubted that in admitting, and in fact asserting, their paramount duty to the inhabitants of Newcastle, the Company assumed a position which was both just and politic. It is always well to remember the terms of the restriction on the construction by a Local Authority of any water-works within the district of an existing Water Company. According to the provisions of the Public Health Act, 1875, this may not be done if, and so long as, such Company are able and willing to supply water proper and sufficient for all reasonable purposes for which it is required by the Local Authority. In these days it is necessary for the Directors of Water Companies to have a very clear perception of the conditions on which the undertakings they control are allowed to exist. In the case of the Newcastle Company, it is evident those conditions have been carefully borne in mind.

The Objections to the Proposed Railway Rates for Coal, Etc.—In reply to a question put by Mr. A. Elliot in the House of Commons last Thursday, Sir M. Hicks-Beach stated that the objections lodged to the revised classification and rates proposed by the railway companies under the Railway and Canal Traffic Act, 1888, would, in the ordinary course, be heard in London at the office of the Board of Trade; but he proposed to make arrangements providing that, where necessary, they should be heard in Edinburgh and Dublin.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INTITUTE.

INFORMATION has reached us from Mr. W. Longworth, Hon. Sec. *pro tem.* of The Gas Institute, that it has been decided to hold the next meeting in London a week later than the time originally fixed, in order to avoid Whit week; and it is understood that the Council have abandoned all idea of going to Paris. The manner in which this change of the place and time of the annual meeting is to be effected is copied from the precedent of Glasgow, in 1887. The meeting will be held *pro formâ* in Brighton, to be immediately adjourned to London, where business will be transacted on the following day. This decision of the Council is significant of much. The postponement of the date of meeting is, of course, unavoidable, in consequence of the lateness of Whitsuntide this year; but the alteration of the place of meeting from Brighton to London, and the interruption of international civilities, show clearly enough that the Council feel that the Institute has changed in some way since last June. We put it that the Institute has lost it representative character, and that its present chiefs feel that they cannot meet the French Society on equal terms. This admission alone excuses what would otherwise be a gratuitous slight to the foreigners who had hoped to return in their own country the hospitality which they received in England last year. This alteration of programme is a curious commentary upon the recent circular of the Council, in which the defection from the Institute is minimized.

The proposed new rules, which we published *in extenso* last week, require a little comment. Some of the suggestions made by the Council refer to points of internal discipline and corrections of errors of drafting, and therefore need not be discussed at length. Others, such as the abolition of the Finance Committee, the addition of an Honorary Secretary to the list of office-bearers, and the alteration of the *status* of the Trustees, are questions of policy which might have formed subjects of profitable discussion under other circumstances. It is impossible to debate such points seriously now, however, when matters affecting the very existence of the Institute are at stake. To use once more a metaphor which has been pretty well worked up in connection with these discussions, it is idle to think about redistributing the duties and grading of the officers of a ship which is actually among the breakers. All these minor points are as nothing to the main question admitted by the Council and others to be the crucial one at the present juncture—the way of dealing with the trading element in the Institute. Mr. Bray has illustrated the effect of importing trade interests into a society formed for the disinterested investigation of technical matters; and the admitted growth of the "tail" of the Institute—touting and treating commercial travellers—has alarmed members solicitous for the credit of the organization to which they belong. Thus while the existing crisis is, in a certain sense, the work of Mr. Bray, it yet involves other developments of the same evil as that which in one aspect he represents. The time has come, in short—and it may as well have come through Mr. Bray as by any other opening—for settling the question whether the Institute is to submit to trade influence or rise above it—whether the "tail" is to "wag the head" or not. As we understand the matter, the best men connected with the gas industry, in or out of the Institute, hold that the right way to treat the "tail" is to cut it off. The Council admit the advisability of this proceeding; but what do they propose to do? Why, to fasten the "tail" on firmer than ever by making it an accepted part of the body. The proposal is: "That the Council be empowered to abolish the class of 'extraordinary members,' and to relegate to the 'associate members' and 'associate' classes every extraordinary and ordinary member whose qualification is not in strict accordance with Rule 3 of The Gas Institute." It should be noticed that, as the proposed new Rule 2 does not mention extraordinary members, this class of unfortunates would be abolished *ipso facto* by the adoption of the new rules, and the Council would therefore not need to "be empowered to abolish" it, as the wording of the disfranchising resolution goes. And the power of "relegating" these individuals being within the discretion of the Council, they may not feel disposed to restore any of them, even to the mutilated share of membership in the Institute which the resolution holds out as possible. This is a matter that requires to be straightened out before we can accept the resolution as a logical pendant to the new rules, or *vice versâ*. To return, however, to the consideration of this troublesome "tail." It has grown out of the working of Rule 5, by what can only be rightly regarded as an abuse of the rule. The rule was intended to give a *status* in the Institute to those persons who "by reason of their professional knowledge or experience are qualified to assist in promoting the objects of the Institute." As a matter of fact, the complaint is that this rule has facilitated the entrance of persons who have sought their own interest rather than that of the Institute; who never take part in its business; but make use of the footing they have gained in the Institute as an excuse for hanging round the meetings, where they force their company and coarse baits upon the other members, to the detriment of the less self-respecting, and the shame and disgust of the more reputable. Now, if what the Council appear to aim at is carried out, the admission of traders, instead of being an abuse of Rule 5, will be its acknowledged purpose; and the last state of the Institute will be worse than the first. All who belong to the Institute by virtue of this rule will feel that there is a slur cast upon them. They will consider that the Institute would have expelled them if it could; but not being able to do so, has "relegated" them as the next best step. The more respectable members to whom the process would apply will leave the Institute in disdain; and the worst of the "commercial" order of satellites will remain, and justify the disesteem in which they will be held. Do the members like the picture?

We hold, however, that the proposed resolution is altogether illegal, and cannot be carried into effect. It, with the remodelling of Rule 2, constitutes a positive and compulsory measure of disfranchisement; while the proposed partial restitution is permissive only. To the Council is to be confided the option of restoring to limited membership persons who have been elected members by the general meeting, and have done nothing to warrant this deprivation of rights. Mr. Bray would be the first to see (and act upon the discovery) that if he allowed the proposed new rules to be passed, he might perhaps "whistle" for readmission under the terms of the resolution. The whole scheme is futile; and the more it is examined the weaker it appears.

A circular has been sent by Mr. Colson to the members of the Provisional Committee, giving a summary of the transactions of the recent meeting at the Hôtel Métropole. After stating that the resolution "That a National and Representative Organization is desirable for the Advancement of the Gas Industry" was unanimously re-affirmed, Mr. Colson remarks that "it was assumed without question that such organization should exclude what is known as the trading element;" and it was also generally felt that no decisive action should be taken until after the general meeting of The Gas Institute in June. The names of the Sub-Committee, appointed to draft rules and report to another meeting of the Provisional Committee to be deferred, as stated, are then given. We published these names a fortnight ago.

AT the last ballot of the Chemical Society, Mr. H. Simmonds, of the Cheltenham Gas-Works, was elected a fellow.

MR. F. W. RUDD, who has been in the employ of the Whitworth Vale Gas Company for fifteen years, has been appointed, out of 72 candidates, to the position of foreman of the Distribution Department of the Rochdale Corporation Gas-Works.

IN the JOURNAL last week we noticed briefly the working of the Darlington Corporation gas undertaking in the half year ending Dec. 31 last; the result being a net profit of £3072. It is gratifying to be able to supplement this statement by an announcement of an advance of £25 per annum in the salaries of the Gas Engineer (Mr. T. Smith) and his assistant (Mr. J. S. Nicholls).

THE Bill lately introduced by the Metropolitan members for "enabling the County Council of London to introduce new supplies of water into the Metropolis, and to acquire rights of existing Water Companies," stood for the second reading last Wednesday; but the matter was postponed to the 26th inst. Baron Dimsdale has given notice of his intention to move the rejection of the measure.

THE annual report read at the recent meeting of the Chemical Society showed that the number of fellows of the Society was 1650, of whom 36 were honorary foreign members. At the same period last year there wer e1571 fellows, of whom 37 were honorary foreign members. In the past year there were 75 original papers published in the Transactions, as compared with 88 in 1887. The number of abstracts last year was 2470, compared with 2277 in1887.

THE *Electrical Review* last Saturday contained the following paragraph:—"It is said that during the intense darkness of Wednesday [the 10th inst.] no light could be obtained during the day from the Grosvenor Gallery central station; one reason assigned being that the boilers were undergoing the process of cleansing. It is in cases of emergency like this that gas has such great advantages; yet many in the electric lighting business seem to consider that the total deprivation of light when most wanted is a matter of little or no consequence."

THE Liberty and Property Defence League, to whose labours in the cause of self-help *v.* State help several references have been made in our columns, have just issued a circular giving a summary of some of the Bills opposed or promoted by the League during the past six sessions. In addition to the work immediately connected with these measures while in Parliament, there have been distributed a very large number of pamphlets, leaflets, &c., in defence of private enterprise against the invasion of State and Municipal monopolies. The circular is a record of useful work carried on by earnest workers, whose labours in resisting socialistic legislation should not go unrecognised.

THE number of deaths from the inhalation of illuminating gas that have been reported in the State of Illinois within the last three years, more particularly in Chicago (where the cheap lodging-houses, and not a few of the better-class hotels as well, because of the incompleteness of the gas-fittings, are responsible for many victims), has attracted the attention of the Legislature. A Bill has been introduced providing that whenever any person shall die from suffocation, caused by illuminating gas, in any hotel, inn, or other public-house, the legal heirs of such shall be entitled to recover as damages from the owner, occupant, or lessee of such hotel, inn, or other public-house, a sum not to exceed $5000, to be sued for and recovered in any Court of competent jurisdiction in the State. The *American Gaslight Journal* says the Bill seems to stand a good chance of becoming law.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 730).

The past week was an extremely buoyant one, though not without temporary lulls and checks at intervals. The general advance in prices is considerable, and in some markets extraordinary. Some home rails, for instance, are said to have marked during last week the highest figures on record. This wave of buying may perhaps be the result of the recent formation of so many trust companies, which must, of course, be large buyers. They seem to be affecting the Gas Market; and good gas securities, paying high rates of dividend, are just the things with which they want to average up. Gas was very active all the week; and advances in price are both numerous and considerable. The demand for the debenture stocks of the Metropolitan Companies is noticeable; and extensive business has been done in South Metropolitan debenture stock, which is the cheapest in the market. Of the ordinary stocks, Gaslight "A" was very brisk and firm; transactions averaging 263, or rather better, and closing very steady. "H" was steadily dealt in throughout the week, at firm figures. South Metropolitans were rather quiet; but the "A" is 1 higher, and the "B" 2. There have been a few transactions at last in Commercials, at improving prices; the last being 270 *ex div.* for the old stock. This is a rise; but it is not enough compared with the prices of other similar stocks, and bearing in mind that an increased dividend is among the possibilities this year, the price of gas having been reduced by 2d. per 1000 feet. In Suburbans and Provincials there is absolutely nothing to note. The Foreign division have been very active; Imperial Continental taking the lead, and improving day by day until the closing mark on Saturday was 217. Some of the Continental Union and European issues have partially recovered their recent drop. Of the rest, Monte Video has been the most active, but none show any change of quotation. The Water Companies have been very quiet, and not particularly firm; though Southwark and Vauxhall, which seems to have its own way of moving independently of the rest, is slightly higher. Kent was steady; but it is already so cheap that it should be less likely than the rest to go lower.

The daily operations were: On Monday, transactions in Gas were evenly distributed through the list; no one issue being busier than another. Prices were good, but unchanged. Water also was quiet and unchanged. Tuesday's business was largely in Gaslight "A;" but a little was done in South Metropolitan "B," and Commercials came to life again after long inaction. Still, quotations did not vary. Water business was nearly all in Kent; but there was one transaction in Southwark ordinary, which rose 2. The "D" stock also rose 1. On Wednesday there were extensive dealings in Gaslight "A," at rather wider figures. The "H" stock and Imperial Continental were also busy; the latter rising 1. South Metropolitan "B" improved 1. Water was almost unnoticed. On Thursday, Gaslight "A" was firmer and steadier. Imperial Continental gained 1 more. South Metropolitan debenture stock was in good demand at nearly top price. *Ex div.* adjustment improved Commercial old 3½; and the new, 2½. Water was quite stagnant. East London was fractionally better on *ex div.* quotation; but Lambeth 10 per cent. fell 1½. General strength characterized Gas on Friday. South Metropolitan "A" and "B" and Imperial Continental advanced 1 each; and there was a rise of ½ in Alliance and Dublin new and in Continental Union and European new. The only feature in Water was the loss of 1 in East London. Business in Gas was brisk on Saturday, especially in Monte Video. Imperial Continental made a further advance of 1½. A single transaction in East London at lowest price, marked "special," was the only thing in Water.

ELECTRIC LIGHTING MEMORANDA.

THE BOARD OF TRADE INQUIRY INTO THE METROPOLITAN ELECTRIC LIGHTING SCHEMES—THE AFFAIRS OF THE ELECTRICAL POWER STORAGE COMPANY—AN AMERICAN ELECTRIC LIGHTING COMBINATION.

Major Marindin is continuing his inquiry into the Metropolitan electric lighting schemes. Having heard the case of the London Electric Supply Corporation, the Inspector took that of the Metropolitan Electric Supply Company, who have begun operations at Whitehall, and contemplate starting stations in Sardinia Street, Rathbone Place, Manchester Square, Eccleston Place, and Waterloo Bridge. They also threaten the City with a station for supplying 120,000 lights. Theirs is to be a direct-current system, with storeage batteries. It is a system which bears the endorsement of Dr. Hopkinson, Professor Forbes, and Mr. J. E. H. Gordon, who did *not* make a great success of the lighting of Paddington Railway Station. As might be supposed, there was a good deal of conflict between the representatives of the London and the Metropolitan Companies, with their two opposed systems of supply; but the evidence on both sides was chiefly "hard swearing," for neither concern has an atom of experience of working under statutory conditions. It is rather amusing, as an example of the ideas that get abroad during the holding of an investigation of this nature, to observe that last week's *Punch* contained a parody on a song of Swinburne's, supposed to be sung by a gas shareholder hurrying to sell his stock in consequence of the statements made by Lord Crawford and others before Major Marindin. This effort of genius may have been the production of one of the fifty legal and professional gentlemen waiting, with the patience born of briefs and supported by "refreshers," for their turn before the Inspector. It is smart in its way, but is more remarkable for "poetic license" than for anything else. As a matter of fact, the gas-share market continues supremely indifferent to what people with their own ends to gain may tell Major Marindin. It will be time enough to look for the effect upon the share lists when these sanguine gentlemen have really done in fact what they talk so glibly about as a matter of intention.

The Electrical Power Storeage Company held their annual general meeting last week, when the Chairman reported "a gratifying increase of business." Of course, the Chairman had a good deal to say about the proceedings before Major Marindin, in which the Company are interested as promoters of Provisional Orders for several Metropolitan districts, and as opponents to the huge grasping London and Metropolitan Companies. They naturally think their own system of electrical distribution the best, and do not want to be interfered with by people who have more impudence, but not more knowledge than themselves. The Company are interested in the Chelsea Electricity Supply Company, which is a joint affair of their own and of the Brush, and Callender Bitumen Companies. At this station the current is generated by Brush machines, conveyed through Callender mains, and stored at sub-stations fitted with E.P.S. batteries. The Chairman thinks this will be a model station; but once more we venture to remark that "the proof of the pudding is in the eating." The proceedings at the meeting were very amicable; only one shareholder presuming to complain of the want of a dividend. He was promptly silenced; and the proceedings terminated with the usual votes of thanks and expressions of hopefulness for the future.

It is reported that a great electrical combination is in contemplation in the United States; the object being the union of all the leading electric light companies, with a capital of £40,000,000. The idea is to put an end to the lawsuits and reckless competition that have rendered dividends scarce up to the present, and keep them problematical for the future, unless some radical change can be effected in the methods of the electric lighting business. It is stated that a "trust of consolidation" is practically agreed upon; but the terms for the component Companies are not yet settled. The Brush is said to be the only Company actually making money, and it is therefore in a position to dictate terms; but, on the other hand, there is reported to be enough money behind the Westinghouse Company to buy up all competitors on a reasonable valuation based upon their profits and prospects. The latter Company has been doing a good deal in this way already; and rumour has it that some other companies have done the same, until there are only three or four really important concerns left. Consolidation would, of course, diminish expenses; but the possibility of its doing good to the industry in the end depends upon whether or not electric lighting has yet arrived at the height of its technical development. The rumour may be false, however, for the report of it goes on to say that "electricity is the coming motive and heating power, and is the present light, as gas is fast disappearing before it." Although it is refreshing to see electric lighting referred to as anything else than the "light of the future," it is difficult to reconcile the assertion that gas is "disappearing before it," even in the United States, with the fact that the output of the American Gas Companies is rapidly increasing. As the *American Gaslight Journal* takes occasion to remark, on Jan. 9, 1884, Mr. T. A. Edison said to a reporter from the *World*, "within five years we shall furnish 98 per cent. of the light" required for New York. Now that the allotted time has expired, it is interesting to record that, so far from the prophecy having been justified by the event, the increase in the quantity of gas sold in New York in 1888 over 1884 was at least 30 per cent. In the meantime, Mr. Edison's "down town" station has just managed to hold its own.

In a recent issue of the *American Manufacturer*, it was stated that steel pipe has been adopted by the Gas Companies of Chicago in preference to wrought-iron pipe for making connections between the mains and houses. The two kinds of pipe had been previously subjected to very thorough comparative tests, which the steel pipe is reported to have endured the most satisfactorily. The quantity to be used this year will be about 1,000,000 feet. The manufacturers of steel pipe regard their victory in this contest as of much importance.

The physiological effects of carbon monoxide upon animals breathing an atmosphere of which it is a component are well known. It is not, however, easy to detect this gas, when mixed with air, by chemical tests. In a recent issue of the *Bulletin de la Société Chimique de Paris*, it is stated that the presence of carbon monoxide in air may be ascertained by passing the air previously filtered through glass, wool, or cotton, over pure dry iodic acid, heated to 150°, and then into starch dissolved in distilled water. The carbon monoxide passes into the state of dioxide, a corresponding quantity of iodine is set at liberty, and the solution of starch is coloured blue. The operation is most conveniently conducted by putting the iodic acid into a small fractionation flask, the delivery tube of which has been bent down so as to plunge into a small bottle containing the starch solution. The flask is then set in an oil bath, and the suspected air is aspirated through it in a moderate current, entering at the bottom of the apparatus. It is necessary to take precautions for the removal of other reducing impurities—such as sulphuretted hydrogen—from the air, or the results might be vitiated. In places where water gas is made and sold for domestic use, a convenient test of this kind might be found useful in connection with the medico-forensic complications that occasionally result.

THE BUILDING EXHIBITION.

The Building Trades Exhibition, held during the past fortnight in the Agricultural Hall, Islington, is one of those small sectional trade displays with which we are favoured from time to time, and which are instructive in their way, although not much patronized by the general sight-seeing public. It is desirable to know what novelties there may be in the market, which cannot be so well examined under other conditions. A possible purchaser does not always like to enter a shop and make inquiries concerning objects he may see in the window, and which he knows he may not want to buy after all. On the whole, we are persuaded that sectional exhibitions are useful, especially if there is none of the exploded nonsense of prize awards in connection with them. There may be prize medals, for all we know, in the scheme of the little show now under notice; but we have nothing to do with them. It is sufficient to know that there were some good things there which "judges" might or might not have recognized at their true worth; and the show as a whole also helped one to form an idea or two respecting the drift of fashion and taste in several matters, such as no system of awards could have inspired. There was a good deal of electric lighting as well as of gas lighting in the hall, and a fair display of oil-lamps. The most satisfactory feature of the gas-fitting exhibits was the absence or insignificance of old-fashioned, ironmongers' patterns of pendants, brackets, and the like. Makers and retailers seemed to have felt at last that glittering lacquer and cheap glass do not make a gas-fixture all that it should be; and consequently nobody paid for floor space to display what may be seen in this line at any plumber's and gas-fitter's. It was very pleasing to see the signs of a revival of true design in connection with gas-fittings and other domestic metal work at the stands of Messrs. Verity Bros., of Regent Street, and W. Hofler and Co., of Jewin Street. At the former, especially, there were many really fine specimens of hammered ironwork as applied to gas-fixtures. The other show was also of wrought ironwork; but principally applied to lamps, fire-grates, &c., and was exclusively German work. There is nothing more pleasing in modern fashion than the tendency to take ornamental wrought ironwork into favour again. Messrs. Verity are not the only firm who have trimmed their sails to catch the favouring breeze; but they have carried out the new departure perhaps more thoroughly than any of their rivals. It is understood that they do not admit a die or stamp of any kind into their forge, for fear lest the integrity of their hammered work should be questioned. The result of this devotion to a principle is highly encouraging to those who wish to believe that art and handicraft may be united again even in this age of machinery. Only a year or two ago such a collection of wrought-iron gas-lamps, standards, and brackets as Messrs. Verity sent to Islington, could not have been got together by searching all the shops in London. It would scarcely have been possible to answer in the affirmative a question whether there yet existed smiths capable of turning out, between the hammer and anvil alone, anything like those crisp ornaments in black iron which their mediæval fore runners have left behind them. Somehow a breath of change arose; here and there an artist-smith gave signs of his existence, and the craft of Quentin Matsys sprang into prominence again, let us hope never more to fall into the cold shades of disfavour. We cannot help dwelling upon this sign of the times, for it is like a return to the age when art really lived among us, to see these beautiful specimens of smith's work which Messrs. Verity are offering to a world that seems to be fairly appreciative of them. They show a hanging lamp of iron and Venetian glass that would adorn a hall better than the vast majority of the pictures that will crowd the walls of Burlington House next month; and it was made by a lad of nineteen. Let us be thankful that such craftsmen are still bred among us.

The regenerative gas-lamp makers were in good force at the exhibition. Mr. Frederick Siemens showed his recuperative lamps of various forms, his horizontal flat-flame lamps making an exceptionally good appearance. Mr. Siemens also showed one of the most promising-looking gas-fires that we have seen for a long time. It has a cheerful aspect, and seems to give a good radiating effect, while the shape is well adapted for the proper position for a gas heating-stove—on the hearth of an ordinary fire-grate. The Schülke lamp was shown in its various sizes, but with special attention to the smaller patterns, for which there is such a great field in domestic lighting. The Wenham lamps were exhibited at the large stand of the London Engineering Company, of New Broad Street, who had a great display of specialities in gas, water, sanitary, and electrical engineering. Fletcher's stoves, the albo-carbon light, and a host of other well-known manufactures intended to make domestic life healthy and easy, were to be found in this exhibit. A new regenerative lamp—or perhaps it would be safer to say another competitor for the favour that has been earned by gas-lamps of this class—was shown under the name of the "Champion." All that we know of this article is gathered from the manufacturers' circular, which states that "coal gas, utilized scientifically and rationally, has complete (*sic*) illuminating power, under perfectly sanitary conditions, when used in the 'Champion' perfect combustion gas-lamp;" and with this we must leave it. Welsbach burners were shown by the Incandescent Gas-Light Company, Limited; and their rivals, the Lewis incandescent burners with metallic meshes, were a feature of Messrs. Verity's large collection. It is hoped that these latter burners may be made available without a chimney, in which case they would lend themselves to a more artistic treatment than is possible at present. A remarkable example of the manner in which ideas are discovered over and over again was supplied at Stott's gas-regulator stand, where an "improved ventilating gas-burner" was shown, which consisted in a pipe with a hood placed over a common wall bracket, and supposed to communicate with the open air! And this is a "patented" invention!

There was the usual show of gas-engines—Crossley's, the "Griffin," "Stockport," "Bisschop," and "Campbell," driving dynamos, or builders' machinery. The "Lucigen" lamps—most useful for outdoor work—were shown in a variety of patterns and sizes. A portable form of this lamp is now made, which is worked by means of a steam-jet generated by the heat of the flame itself, which also converts the oil into a gas and produces a brilliant flame, avoiding spraying the oil. Among the miscellaneous exhibits we noticed that of the Universal Patent Fuel Machine and Manufacturing Company, Limited, of Fenchurch Street, which comprised briquettes composed of gas-works breeze and pitch. These briquettes measure 4½ in. long by 2½ in. wide and 2½ in. thick, weighing a little over 1 lb. We consider that even these are much too large for the ordinary consumer, who does not want fuel bigger than an egg to burn in any kind of domestic stove. Messrs. Geo. Waller and Co., of the Phœnix Engineering Works, showed a collection of sanitary castings and ironwork. Altogether the exhibition was worth a visit.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XV.

A *résumé* of the present state of knowledge on the illuminating constituents of coal gas was given in the columns of the Journal in 1885,* in which the differences of opinion to which attention has previously been directed in these articles are considered at length. The general tone of the article goes to show that the character of the illuminants is by no means perfectly understood; and especially that very wide differences exist between the proportion of them by volume and the observed illuminating power in different samples of gas. It is therefore impossible that the percentage of illuminants as stated in analyses should furnish any idea of the value of the gas. The writer first noticed the hydrocarbons of the ethylene series, which for some years were supposed to be practically the only source of illuminating value; and pointed out that Dr. Frankland is greatly responsible for the propagation of the idea that ethylene is the chief if not the only illuminant, by introducing the plan of calculating the quantity of condensable hydrocarbons into its equivalent of ethylene. Two other members of the ethylene series—propylene and butylene—having the constitution C_3H_6 and C_4H_8 respectively, are also generally admitted to be present in coal gas. As the plan originated by Dr. Frankland has been followed by most of the later investigators, it will be fitting to refer to it here. While it is a convenient form of colloquial expression among skilled chemists, its use is anything but clear to outsiders. In a recent number of the Journal,† some analyses of London gas made by Mr. Wilson are quoted; and it is stated that the average composition of the "olefines" is 1 vol. = 1·81 C_2H_4. This means that the specific gravity of the illuminants is 1·81 times greater than that of ethylene, and is simply a method of giving an idea of their specific gravity. We have already observed that the weight of the illuminants is probably of more consequence than their bulk; and therefore it is evident that a statement of their specific gravity is an important *datum* in indicating the quality or value of the gas. It would be better, however, to state this in plain language, leaving on one side the ambiguity of calculating out one substance in terms of another.

There is reason to conclude that hydrocarbons of the acetylene series are present in small quantity in coal gas. And it is generally believed that the value of acetylene is very much higher than that of ethylene, although its carbon density is the same. This point of itself illustrates the fallacy of endeavouring to arrive at the value of a gas by considering the specific gravity or the carbon density of the illuminants. Dr. Armstrong's opinion is that the illuminating power of oil gas is attributable in no slight degree to acetylene, crotonylene, and other members of the same series; and also thinks it probable that likewise in coal gas much of the illuminating power is due to members of the acetylene series.

The writer of the article under consideration passes on to review the various authorities who have found benzene in coal gas, and also advances considerations in support of the view that other of the lighter constituents of coal tar are present in the gas, if only in infinitesimal quantity. He refers to the fact that vapours such as benzene are known to be capable of dissolving and carrying with them heavier substances of allied composition, which ordinarily exist only in the liquid, or it may be in the solid condition. So it might be inferred that the former would not be present in the gas without some trace of the latter. Bowditch had proved by experiment that such was the case. By passing ordinary purified gas through light coal naphtha, he obtained a dense tarry substance possessing all the properties of heavy coal tar. Some of the oils so dissolved were of such high boiling-points that they could not be distilled except at a temperature that softened Florence flasks, and even pitch could be obtained from the fluid.

The effect of the various absorbents in general use is next

* See Journal Vol. XLV., pp. 148, 193. † See *ante*, p. 615.

considered. Dr. Frankland and Mr. Lewis Thompson are quoted as authorities for the statement that the action of chlorine, bromine, and fuming sulphuric acid is identical—*i.e.*, that they condense and remove exactly the same ingredients. Coal tar naphtha has been tried by Banister, who states that, by employing a naphtha having a specific gravity of not less than ·800, and a temperature not exceeding 60° Fahr., the condensation by naphtha was identical with that of bromine. The defects common to the three reagents first named are considered at length, and appear to be reducible to two serious charges. The first is that they will not always remove the whole of the illuminants. Their effect upon benzene is doubtful. As to acetylene there is some difference of opinion, perhaps due to the observation of Berthelot, that bright sunshine is necessary to the combination of acetylene with bromine. Even in bright diffused daylight a mixture of acetylene and bromine vapour may remain for several minutes without combining. Another difficulty is no doubt due to the extremely dilute nature of the mixture. The second charge is that the vapours formed as the result of the combination are not entirely removable by the action of water and potash, as is generally assumed to be the case. As regards the first objection, there is the fact which was pointed out 40 years ago by Mr. Lewis Thompson, and has since been repeatedly illustrated—viz., that the residuary gas remaining after treatment with either of the above absorbents possesses an appreciable illuminating value. There is reason to believe that a portion of this is due to the presence of members of the paraffin series. Marsh gas or methane—the lowest members of this series—is always present in large quantity; and the other members whose presence is suspected are ethane $C_2 H_6$, propane $C_3 H_8$, and butane $C_4 H_{10}$. They are known to be unacted upon by fuming sulphuric acid; but Dr. Frankland has pointed out that they may be absorbed by means of alcohol, and subsequently separated in the gaseous form by the addition of water or by ebullition. Bromine and fuming sulphuric acid are also open to the objection that has been mentioned with regard to chlorine—viz., that they are not without action on hydrogen and marsh gas. Mr. Lewis Thompson, quoting Dumas as an authority, points out that even common sulphuric acid combines with, and is decomposed by hydrogen gas at ordinary temperatures with the production of water and sulphurous acid. Fuming sulphuric acid being more active would be more liable to this source of error.

In a large number of experiments carried on at the experimental works belonging to the Paris Gas Company, situated at La Villette, the method of analysing the gas included absorption by bromine in the usual way. A special test was also made by reducing the gas to a low temperature. The gas was first dried, and then caused to circulate slowly through a serpentine tube surrounded by a mixture of ice and salt. The hydrocarbon condensed by this means was considered to be benzol. The following represents a summary of the results, each of the numbers I. to V. representing the average of a large number of samples of different gases.

	I.	II.	III.	IV.	V.
Hydrogen	54·210	52·790	50·100	45·450	42·360
Marsh gas	33·370	33·430	34·030	35·420	36·140
Nitrogen	1·000	1·000	1·000	1·000	1·000
Carbonic oxide	6·680	7·190	8·210	9·860	11·930
Carbonic acid	1·470	1·580	1·720	2·790	3·130
Benzols	0·790	0·990	0·960	1·040	0·880
Other hydrocarbons	2·480	3 020	3·980	4·440	4·760
Specific gravity	0·352	0·376	0·399	0·441	0·482

A departure from the usual practice is followed in these analyses. Instead of entering the difference as nitrogen, a constant proportion of 1 per cent. of that element is assumed; and the difference is set down as marsh gas. The quantity of benzol appears to be fairly constant, as might be expected; seeing that this vapour is probably carried by the gas through the purifying apparatus, and resists the action of water and other influences that would tend to remove it. A cubic metre of gas was found to yield 39 grammes of benzol; representing 10·50 litres or 1·05 per cent. by volume of the gas. And this 39 grammes is said to be composed of 30 grammes of benzene and 9 of toluene. The other hydrocarbons are stated to consist of ethylene, propylene, and butylene. The cubic metre of average gas just referred to was found to have a specific gravity of ·410, and to weigh 530 grammes. It contained besides the benzol 4·4 per cent. of hydrocarbons; or by weight 39 grammes of benzol, and 60 grammes of other hydrocarbons, representing 7 and 11 per cent. respectively.

It will now be convenient, in order to get further light upon this somewhat intricate subject, to direct attention to the composition of illuminating gas obtained in other ways. In 1851, Dr. Frankland made an exhaustive examination of gas made by White's process, which was a combination of water and resin gas. The following table (which appeared in the JOURNAL, Vol. II., p. 125) represents the average of four samples:—

	White's Gas Unpurified.	White's Gas Purified.	Manchester Gas.
Illuminants	7·410	8·130	5·500
Hydrogen	40·270	43·380	45·740
Marsh gas	26·500	29·710	40·120
Carbonic oxide	18·550	18·780	8·230
Carbonic acid	7·270	—	0·410
Specific gravity	·658	·591	·524

White's gas requires special purifying apparatus to deal with, the very large proportion of carbonic acid present in it. Ordinary lime purifiers only reduce it from 4 to 5 per cent., and therefore leave about two-thirds of it in the gas. It will be described in greater detail farther on. Dr. Frankland also directed his attention to the use of various cannels instead of resin; and some of the results recorded by him are shown in the following table:—

—	Wigan Cannel (Ince Hall).		Boghead Cannel.		Lesmahago Cannel.		Methyl Cannel.		Ramsey's Newcastle Cannel.	
	A	B	A	B	A	B	A	B	A	B
Illuminants	10·81	10·55	24·50	14·12	16·31	10·89	14·48	11·06	9·68	9·04
Marsh gas	41·99	27·20	58·38	22·25	42·01	18·94	38·75	22·89	41·38	26·84
Hydrogen	35·94	47·39	10·54	45·51	26·84	55·09	33·32	45·58	33·30	44·26
Carbonic oxide	10·17	14·86	6·58	14·34	14·18	15·02	13·40	20·44	15·64	19·39
Carbonic acid	1·19	..	—	3·78	0·66	0·06	0·05	0·03	—	0·47
Illuminants in terms of olefiant gas	15·13	13·72	31·11	19·84	28·30	19·05	18·53	14·04	16·94	13·15

The experiments marked A are taken by the ordinary process; and those marked B by White's process, which consisted, in short, of loading the coal gas with as much water gas as it would take without yielding an article of inferior illuminating value. This will be seen by the increase in the quantity of hydrogen and carbonic oxide in B as compared with A. It is strange, however, that the proportion of this substance should run so high as 14 or 15 per cent. in gas made by the usual process.

An elaborate report on the Gwynne-Harris process, which is somewhat similar in character to White's, was prepared by Professors Wurtz and Silliman,* from which the following analyses are extracted:—

	Hydrocarbon Process. Bituminous Coal with 10 p. c. Albertite.	Ordinary Process. Bituminous Coal with 6 p. c. Albertite.
Hydrogen	42·59	42·47
Marsh gas	33·74	46·10
Illuminants	6·34	6·67
Carbonic oxide	8·71	2·08
Air	8·93	2·68

MR. GADD'S SYSTEM OF GASHOLDER CONSTRUCTION.—A two-lift telescopic gasholder, without upper guide-framing, on Mr. W. Gadd's spiral-guide principle, is about to be erected at the works of the Northwich Gas Company. It has been designed by Mr. T. Newbigging, C.E., and is 60 feet in diameter; each lift being 20 feet high. The contract for the tank has been given out; and the work will be commenced at once. That for the holder will probably be let in the course of the next few weeks.

* See JOURNAL, Vol. XXIV., p. 544, *et seq.*

NEW TESTS FOR CAST IRON.—The modern predilection for precise comparative tests of materials, which has made the testing of Portland cement almost a science of itself, has made the "Keep" tests for cast iron increasingly favoured in British foundries. The old practice in specifying the quality of cast iron was content with describing the mixture of the pig, the physical character of the product, and its breaking strength. The tests now in question, however, furnish more precise indications of the quality of cast iron. In carrying them out a sample of the metal weighing 15 lbs. is melted in a plumbago crucible set in a blast furnace, and from this three sets of test bars are run. One bar is ½ inch square, and is cast with both ends against chills 12½ inches apart. Another bar, also run between end chills, is ½ inch wide and 0·1 inch thick. When the bars are cooled, so that they and the chills are of the same temperature, the shrinkage is measured by inserting a taper gauge between the end of each bar and the chill. A third bar is run to test fluidity; the mould being 12 inches long, 1 inch wide, and 0·06 inch thick. This is run from one end, and is poured first; but the strip rarely runs full to the end, and its length is taken as the index of the fluidity of the metal. The fourth bar is called the "crooked strip," and is 12 inches long, 1 inch wide, and 0·086 inch thick. On the centre of one side is a rib 0·412 inch high, 0·2 inch wide at the base, and 0·1 inch wide at top. The unequal shrinkage of the thin flat strip and of the taper rib, causes a slight curve in the bar, and the measurement of this is called the "crook." The square bar is tested for transverse strength by means of a gradually applied weight; the deflection being measured at the same time. The second rectangular bar is tested for resistance to impact; the test being the fall of a 25-lb. hammer at first with a fall of ½ inch, increasing by eighths of an inch until the bar breaks.

Technical Record.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

To-day we give a second instalment of the summary of the proceedings at the annual meeting of the above Association, prepared from the Official Report, as published in the *American Gaslight Journal*.

Dr. LEWIS M. NORTON, of the Massachusetts Institute of Technology, delivered a lecture on "The Composition of Boston Gas," prefacing his remarks by saying that, although his experiments had been mostly confined to Boston gas, and any new figures he might be able to give would relate especially to that gas, he did not propose to limit himself to it, but would discuss the general character of the illuminants and their office. Common coal gas consisted of two distinct classes of bodies—the illuminants or light-givers, and the diluents or light-bearers. The diluents influenced the temperature of the flame, but had comparatively little power in themselves, though recent experiments showed that marsh gas, which had always been classed among the diluents, was capable of furnishing a certain amount of light; so that, while it was properly a diluent, it was also to a certain degree an illuminant. The analyses of the State Inspector of Massachusetts, seldom showed above 6·5 per cent. of illuminants in coal gas; the remainder consisting of diluents. The difficulties connected with the subject had generally deterred examiners from anything more than an estimation of the total volume of the illuminants. They had paid very little attention to the character of that volume, because the problem was one of great difficulty. Certain of these illuminants were present in very small proportion only, and were very hard to separate. The assumption sometimes made that two gases, having the same percentage of illuminants and all other constituents, ought to have the same candle power, did not appear to be borne out by experience, and was erroneous from a theoretical point of view. It would be found that the photometrical value had no relation to the percentage of illuminants present. It was affected by their character; but the volume of illuminants was probably a matter of minor importance.

Attention was next directed to the following table:—

Certain Constituents of Coal Gas and Naphtha Gas.

—	Symbol.	Carbon per Cent.	Hydrogen per Cent.	Condition at Ordinary Temperature.
ILLUMINANTS.				
Ethylene	C_2H_4	85·71	14·29	gas
Propylene	C_3H_6	,,	,,	,,
Amylene	C_5H_{10}	,,	,,	liquid
Hexylene	C_5H_{12}	,,	,,	,,
Crotonylene	C_4H_6	88·80	11·20	,,
Acetylene	C_2H_2	92·30	7·70	gas
Benzol	C_6H_6	,,	,,	liquid
Toluol	C_7H_8	91·30	8·70	,,
Pentane	C_5H_{12}	83·38	16·67	,,
Hexane	C_6H_{14}	83·72	16·28	,,
DILUENTS.				
Marsh gas	$C\ H_4$	75·00	25·00	gas
Ethane	C_2H_6	80·00	20·00	,,
Carbonic oxide	$C\ O$	42·85	—	,,

The illuminants were rich in carbon and poor in hydrogen; and it had been said that their value depended upon the relative percentages of carbon and hydrogen present in them. The greater the percentage of carbon, the higher the illuminating value; and this could be substantiated to some extent. All the substances mentioned were present in coal gas; but amylene, hexylene, pentane, and hexane were only found in very small quantity. These four substances, however, were present in much larger proportion in gas that had been enriched by means of naphtha. Naphthalene possessed the highest illuminating value of any hydrocarbon at present known; but it was not placed in the above list, because he had never been able to find it in Boston gas. Although known to be present in tar in large quantity, and although the stoppages in mains and services were said to be due to deposition of napthalene, very few investigators had ever been able to discover it in coal gas. Its percentage composition—93·75 carbon, and 6·25 hydrogen—was higher in carbon than any constituent given above; and, therefore, if the theory previously stated was correct, it should be the most effective of all the hydrocarbons, though benzol and acetylene are not far behind. It was known to possess high illuminating value, and had been applied to enrich the gas near the burner.

In all old books relating to gas, allusion is made to ethylene as the important illuminant; but, in 1876, Berthelot found that Paris gas contained 3 to 3½ per cent. of benzol; and since that time chemists had become more and more inclined to the view that benzol, which was always accompanied by a small quantity of toluol, was an important constituent so far as illuminating power was concerned. Crotonylene was almost invariably formed by the action of heat on petroleum naphthas, so it probably played an important part in coal gas enriched by naphtha.

The examination of these illuminants by the ordinary methods of gas analysis being entirely out of the question, special means were adapted for extracting them from comparatively large volumes of gas. Ethylene and propylene were extracted from the gas by means of bromine, which absorbs them readily. From 15 to 25 cubic feet of gas were operated upon in each of the experiments, the bromides being separated and weighed, and the percentage of hydrocarbon calculated from the weight of bromide obtained. The bromides obtained from bromine that had been charged with the matters absorbed from the gas, were distilled *in vacuo*, and fractionated. The bromides of ethylene and propylene left on distillation *in vacuo* a solid residue, which was purified by crystallization, and found to consist of bromides of crotonylene and benzol, which could be separated by crystallization. In attempting to separate the benzol, it was found the bromine would absorb some but not the whole; and that nitric acid not only took up the benzol, but also hexylene, amylene, and other illuminants, yielding a product from which the nitro-benzol could not be separated. Recourse was then had to olive oil as an absorbent. If gas is passed through olive oil, heavy tar oil, or heavy petroleum, those illuminants which are liquid at ordinary temperatures (see above table) are removed. Gas was passed through olive oil; and the hydrocarbons that were absorbed were obtained by heating the oil and passing steam through it. The steam carried them off, and they were condensed and separated from the water, and found to consist mainly of benzol and toluol. The crotonylene was probably absorbed; but not condensed, on account of its extreme volatility. Acetylene was determined by passing the gas through subchloride of copper solution, filtering off the red precipitate which formed, decomposing it with hydrochloric acid, absorbing the acetylene with bromine, and weighing the bromide thus formed. Not more than 0·05 to 0·10 per cent. was found to be present in the gas. Naphthalene was searched for by passing large quantities of gas through alcohol, in which it is very soluble, also by treatment with heavy petroleum naphtha; but not the slightest trace could be obtained. Cold and pressure to the extent of 75 lbs. per square inch and 9° Fahr. were resorted to; but without effect. So the Boston gas was considered to be practically free from it. The other constituents were examined by the usual Hempel process. With regard to the high percentage of nitrogen, the lecturer was inclined to think that the Hempel process yields uniformly high results for this substance—higher than those furnished by the Dayere apparatus as used by the State gas inspector.

The following table represents analyses of gas from various sources. No. 1 is Boston gas examined by Norton and Doolittle; No. 2 is Königsberg gas, by Blochman; No. 3 is Heidelberg gas, by Kinnicutt and Tredwell; Nos. 4 and 5 represent Hanover gas, by Fischer; No. 6 is a sample of Manchester gas, by Davis; and No. 7, Paris gas, by Berthelot:—

Analysis of Coal Gas in Volume per Cent.

	I.	II.	III.	IV.	V.	VI.	VII.
Ethylene	2·30	2·01	2·55	2·48	2·11	2·24	0·1-0·2
Propylene	0·73	0·72	1·21	0·64	0·37	—	0·02
Benzol	0·83	0·66	0·69	0·59	0·69	2·00	3·0-3·5
Acetylene	2·17	—	—	—	—	—	0·10
Crotonylene							—
Carbonic acid	0·12	1·40	3·01	0·48	0·81	2·94	—
Carbonic oxide	6·08	4·00	8·88	7·42	11.19	6.00	—
Marsh gas	42·32	35·28	34·02	38·75	46·27	41·50	—
Hydrogen	35·25	52·75	46·20	47·60	37·55	45·70	—
Oxygen	0·12	—	—	0·02	—	—	—
Nitrogen	9·98	3.18	2·15	2.02	1·01	—	—
Specific gravity	0·41	0·37	—	—	—	—	—

The Boston gas is enriched with naphtha; but the others are believed to be pure coal gas. The effect of this is seen in the large proportion of Acelytene and Crotonylene present in No. 1. The fact that the illuminants in the Paris gas were chiefly benzol, as shown by No. 7, had been called in question; but the lecturer considered this Berthelot had on the whole maintained his point. Although never observed in any other town it was confirmed by several analyses of the Paris gas.

The illuminating power of the gas was repeatedly tested, both before and after treatment with olive oil. The result was to reduce the illuminating value from 18½ to 7 candles. This oil thoroughly removed the liquid, but had never been found to absorb the gaseous illuminants; from which it would appear that 11½ candles illuminating value were due to the 3 per cent. of benzol, acetylene, and crotonylene. Frankl and had found that the illuminating value of ethylene was 68·5 candles. Knublauch and Frankland agreed in putting the value of benzol at six times that of ethylene, which would be 411 candles. The presence of only a very small proportion of benzol was therefore sufficient to make an enormous difference in the illuminating value of a gas. Frankland also found that a mixture of marsh gas and hydrogen must have 13·4 per cent. of ethylene added to it, to make a 16·8-candle gas; but the 3·1 per cent. of benzol gave a 22·9-candle gas. This was by volume; but if calculated out in terms of weight, benzol was only about twice as valuable as ethylene. Still it might be asserted that benzol was the most valuable of all the illuminants. Davis had operated on large quantities of gas, and found that 75 per cent. of the illuminants extracted from them consisted of benzol.

Whilst the percentages of illuminants by volume appeared very small, these bodies were much heavier than the diluents; and if the analyses were calculated out by weight instead of by volume, the figures were very different, as would be seen by the following table which consisted of Nos. 1, 2 and 6. from that previously given:—

	I.	II.	VI.
Ethylene	5·4	5·1	5·0
Propylene	2·5	2·7	—
Benzol	5·4	4·7	12·5
Carbonic oxide	14·1	22·7	13·0
Hydrogen	5·9	9·7	7·1
Marsh gas	57·2	51·7	52·0

On the basis of weight percentages, the illuminants ran from 12½ up to 17½ per cent.; and they really constituted a considerable proportion of the gas. There was also a great difference in the weights of various illuminants, as for instance benzol and ethylene, so that analyses giving equal results by volume might really represent very different proportions by weight. Therefore the expression of percentage by volume was quite deceptive from this point of view. A sample of Boston tar contained 0·4 per cent. of benzol, about a similar quantity of toluol, and rather less of xylol. Calculating on a basis of 4½ per cent. of tar, and 10,000 cubic feet of gas per ton, it appeared that all the benzol with the exception of about 3 per cent. went into the gas. This agreed fairly well with figures obtained at Paris during the ten years ending in 1886, which showed that about 96 per cent. of the benzol went into the gas. Therefore, if benzol was to be extracted from the products of distillation, the place to look for it was evidently in the gas and not in the tar. Granting that benzol was the most valuable of the illuminants, what was the best enricher to bring up the quality of gas? The choice was between cannel, naphtha, heavy oils, and crude oil. Some experiments tried by the lecturer on albertite cannel gave 27 per cent. of illuminants, which consisted of almost no ethylene, comparatively little benzol, and mainly propylene and hexylene. Naphtha furnished very little benzol, but large quantities of ethylene and propylene. Heavy oils would yield more benzol. Tar had been recommended as an enricher; and it contained perhaps 12 to 15 per cent. by weight of hydrocarbons of the benzol series, which would give rise to benzol on decomposition. So by a proper use of the tar, a gas of high candle power might be furnished; but the volume would not be large. Simple heating of the tar would not be sufficient; but the heat must be strong enough to decompose the hydrocarbons.

Another question upon which very little research had been made was the effect of the diluents on the value of the various illuminants. The character of the diluent might have a great deal to do with the actual amount of light furnished. It had also been observed that, though naphtha yielded but little benzol when distilled by itself, it would produce 1·5 to 2·6 per cent. when heated with water gas, as in the Granger process. The lecturer considered that looking at the production of benzol from a purely theoretical point of view, with high heats less benzol would be present in the gas; and rather deprecated the modern tendency to high heats that would produce the greatest volume of gas, as likely to cause the benzol vapours to undergo a certain amount of decomposition in the retort. It had been a question whether benzol was formed inside the retort by the action of the heat upon acetylene and ethylene, or whether acetylene was formed by the decomposition of benzol. He believed both reactions took place.

Mr. Learned commenced the discussion by saying that he could get as good quality gas from a yield of 11,750 cubic feet as from 11,200 cubic feet per ton. His tar contained very little light oil; and from the analyses of the State inspector, the effect of increasing the yield was to slightly increase the hydrogen and carbonic oxide and to decrease the marsh gas. The illuminants were very low, only 4·3 per cent. He believed the explanation was that, with the higher yield, he got an increased quality of illuminants. He used Lima oil as an enricher, and found that the gas contained about 3 per cent. of benzol. Mr. Samson thought that naphthalene was always present, or could be obtained from, any ordinary gas; and he believed it would be easy to develop evidence of its existence in Boston gas. Mr. Boynton asked for some information as to the effect on the illuminants of exposure of gas to a temperature below freezing point. Mr. White was greatly interested in the information as to the small quantity of benzol present in the tar, which was fully substantiated by some experiments he made some time ago on the enriching of gas by means of tar. Dr. Norton, in replying, said that Mr. Learned used one of the very best enrichers. He could not explain about the naphthalene, and was of opinion that it would not be formed by synthesis in the gas. The effect of cold applied to gas would be first to condense the toluol, then benzol, then hexane, next the hexylene, and the pentane and amylene about together.

Mr. H. S. Chase, of Great Falls (N. H.), read a paper on "Some Experiences with a Springer Cupola." More than half his consumption was taken by one firm, which were large cott on manufacturers, and therefore the demand was subject to considerable fluctuation. This was the chief reason his coal gas benches were replaced by the cupola. This was supplied under guarantee as to cost and quality of gas, and was 25 feet high by 4 feet diameter. It would take 600 lbs. of coal; and was furnished with a double extra wrought-iron pipe grate. Below the grate an air blast was admitted which forced the combustion upwards. Just above the charging door, the generator was closed by a solid arch, so that when heating up the producer gas was forced to turn at right angles, and pass through a brick-lined iron tube to the superheater, which was placed above the generator. By this arrangement, the cast-iron valve and seat were away from the direct action of the fire. The superheater was filled with chequered brickwork in the usual manner, and had nozzles fitted at the bottom and also half-way up, for admitting blasts from the blower to complete combustion, when heating up. This cupola had been specially designed to produce 20-candle gas with a consumption not exceeding 5½ gallons of Lima oil per 1000 cubic feet; and the generator was sunk below the ground level, so that the charging door was even with the retort-house floor. The depth below ground was 8 feet. Steam at 80 to 100 lbs. pressure was admitted above the coal in the generator, and passed downwards, when gas was being made, to a pipe in the ashpit which was carried up outside to the top of the superheater. At this point the gas met a jet of oil thrown in by a steam injector, and passed downwards, gradually reaching the hottest part of the brickwork. From the bottom of the superheater, it passed away to the usual condensers and purifiers. One disadvantage was a certain complication of parts, as there were nine gates and valves to be handled twice in each 20 minutes run; but, on the other hand, working expenses were low. With one man to attend to it, 40,000 cubic feet of gas per day could be made without exceeding 38 lbs. of coal (which did not include 10 lbs. of coal used for the boiler) and 5½ gallons of oil per 1000 cubic feet. The oil was very cheap, costing less than 1½d. per gallon; so he was able to put the gas into the holder at a very reasonable figure. He was not altogether satisfied with the process. The gas had a very powerful odour when escaping unburned. If the apparatus was not in first-class condition, a light tar was formed that would pass the condensing and purifying apparatus and appear at the burners, giving an odour to the products of combustion from the gas. Although he could get a 24-candle gas or more with the 5½ gallons of oil, it was liable to smoke and smell when burning; and so he preferred to use less oil and make a 20 to 22 candle gas. Some difficulty arose at first in finding out the proper way of handling the condensers and purifiers to suit the new gas. Another trouble was that previously to introducing the water gas, he had introduced albo-carbon burners, and the new gas would not work well with them, as it tended to form a deposit of carbon in the heaters. It did very well, however, with incandescent burners. He could make a better gas than before, and do it more cheaply, though perhaps not much less than would be permitted by modern methods of coal gas manufacture. He was able to meet the great variation in demand; and certainly found the gas to be more poisonous than coal gas. The specific gravity was greater, so that burners about two sizes larger had to be used to get a proper sized flame.

Register of Patents.

Manufacture of Gas.—Dinsmore, J. H. R., of Liverpool. No. 2096; Feb. 11, 1888. [1s. 3d.]

The interest attaching at the present time to the "Dinsmore Process" will justify extended reference to, and quotation from the specification of this patent, which appears to be the one under which the Dinsmore Company are at present working. The patentee says:

"This invention relates to the manufacture of illuminating gas from coal in closed vessels or retorts; but it relates more particularly to those processes of manufacturing illuminating gas by which it has been proposed to render permanent practically all the heavy or tarry vapours or liquors, as well as the light products given off from coal by distillation, and to so make them useful for the production of light and heat.

"My present invention has for its object, amongst other things, (*a*) to convert the tar or tarry liquors or tarry vapours given off from coal in distillation, into permanent gas; (*b*) to effect this object and those above specified by certain modes or methods and apparatus; and (*c*) to carry out these and other objects incident to the process by apparatus in which the ordinary retorts of gas-works are rendered available for making gas according to my invention.

"I will first describe the mode or method by which I convert the tarry products resulting from the distillation of coal in retorts into permanent gas. It is found in the manufacture of gas, whether produced in the ordinary way, or in the manner hereafter described, that a certain quantity of tar or tarry products are obtained from the gas when cooled. It is these matters or products which I convert into permanent gas; and the essential feature of this portion of my invention consists in introducing such tar or tarry products into heated chambers, ducts, or vessels, in the presence of gas which is being, or has been produced from coal used in the retorts. The method may be carried out in various ways, and in various forms of apparatus. For instance, I may carry it out by collecting the tar and tarry liquids in a tar-main through which the gas may also pass on its way from the retorts, and conveying them back to the retorts or heated ducts, hereafter described, whereby they would be converted into gas in the presence of the gas passing off from the coal and passing through the chamber, retort, or ducts. In carrying out this part of my invention, the tar or tarry liquor would be conveyed to the heated chamber or ducts at the time most conducive to the best efficiency—that is, while the hydrogen of the coal gas is present, and in such a condition that the gases resulting from the vaporized tar combine with it and form permanent gas.

"Under head (*c*), my invention consists in the construction and arrangement of gas-making apparatus of the type above specified, by which the retorts at present in use in gas-works can be used. In setting forth an example of the application of this head of my invention, I will take and describe it as applied to a bench of single retorts set in the ordinary way. Then, in such an instance, above the nest of retorts and subjected to the heat of the furnace gases, I dispose a number of sets of pipes through which the gas after leaving the retort is passed. The ordinary existing form of retort mouth and lower length of the ascension-pipe may be used when required or suitable; or the retorts may be provided with special mouths and ducts, connecting them with the above-specified heated ducts or pipes. The gas made in the retorts is led from the mouths of the retorts to the heated ducts, and passed through them; and the greater portion of the gas is thereby rendered permanent. The heated ducts may be either plain pipes, or they may be provided with cooled passages or surfaces, by which the bulk of the non-permanent and tarry vapours would be arrested, and caused to flow back into them, and ultimately converted into permanent gas. It is preferred that each retort should be provided with its own duct or set of ducts.

"It will be seen, from the above description, that to use the existing retorts of a gas-works in apparatus constructed according to this invention, it is only necessary to provide the sets of heated ducts, with or

without cooled surfaces or passages, and place them above the retorts as described; the gas made in the retorts being passed through the heated ducts. In some instances it will be necessary to add to the height of the retort-bench walls, and to raise the roof; but it is evident that the nature and degree of alteration or addition required will necessarily depend upon the condition under which the invention is to be applied.

"One convenient arrangement of heated ducts provided with cooled surfaces consists of two ducts disposed horizontally, or at an inclination, and having at their rear ends upright parts which pass through the roof of the bench. At this point, they are provided with a cooling jacket and a chamber, in which the ends of the pipes open. In this chamber tar or tar and water is maintained; and the chamber is so constructed that the gas has to pass through a small depth of liquor on its way from the exit of one pipe to the entrance of the other. This chamber forms a kind of sealed hydraulic main, or tar trap—one portion being open to the atmosphere; and into this trap the tarry liquors from the gas-main may be led, as above described. They will thereby flow over the lip of the first upright duct (which is the lower of the two) and down it; and so convert it into gas, and go along with the rest. At the exit of the second pipe, I may provide a second cooling jacket or surface also vertically placed upon a second upright portion of the pipe. Suitable doors are provided at all points where required for gaining access to the interior of the pipes for cleaning or scraping.

"By the latter construction of ducts, the coal is distilled in a retort and passed through a heated duct, and then is passed through a cooled passage. After this it is again passed through a heated duct; and then finally through a cooled passage. By this means the gas is first subjected to heat after leaving the retort, by which a great portion of the gases in a non-permanent state are made permanent. It is then subjected to cooling influence; and thereby the greater portion of the condensable tarry vapours or gases are arrested by condensation—the tar resulting therefrom, falling into the heated ducts, is reconverted into gas. And, finally, the gases or vapours still existing in the gas are again subjected to a cooling influence; and a portion of the tarry vapours are thereby condensed, and fall into the heated duct, where they are converted into gas."

Fig 1.

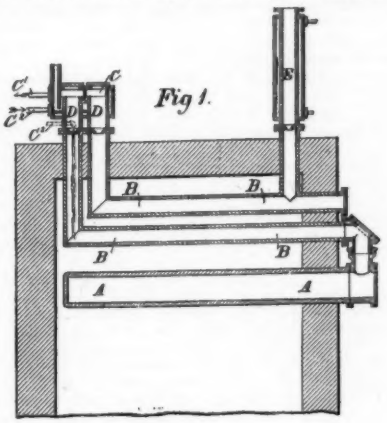
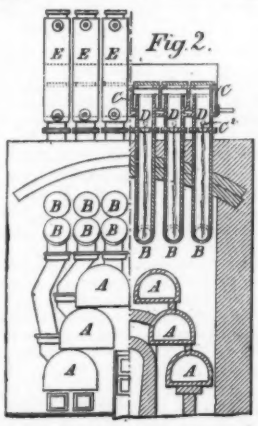


Fig 2.



In the illustrations, A is the bench of retorts, set closely together in the ordinary way. B are the heated ducts; each retort being provided with a double one. C are chambers, constructed in the form of a trough; and D and E are cooled passages. In this example, if A represents a set of existing retorts, then all that it is necessary to do to render the retorts applicable for use in carrying out this invention is to introduce the heated ducts B, and apply the chamber or seal trough, and cooled passages; the other details or parts being either retained or others used in their place, as may be required or deemed expedient. The chambers C consist of a horizontally arranged trough separated into a number of sub-chambers by partitions. Each chamber is provided with passages D; also with a curtain and a cooling jacket at one side and at the bottom. The sealing in the chambers C, by which gas is prevented from returning to the retorts when the doors are opened, is effected by curtains, the lower edges of which dip into the tar which lies in the trough between the two pipes forming the passages D. There is a curtain to separate the chambers C into two parts; one being the part through which the gases from one of the cooled passages D pass from one to the other of the passages D; and the other being the part to which the tar return-pipe C^2, and an ammoniacal liquor escape-pipe C^1 is connected, and into which the tar returned from the gas-main and condensers may be introduced. The upper part of this portion is open to the atmosphere, as shown; and the lighter liquors which find their way into it are taken away from it by the escape-pipe C^1. When the liquid in this outer part rises to a certain height above the lips of the passages D, the tar, which will lie at the bottom, will be forced under the edge of the curtain and up into the inner portion of the trough C, and so on up to the level of the lip of the passages D. When it rises to slightly above this level, it falls over the lip of the passage D and down it. In doing so, and before entering the ducts B, the tar will have to flow over the point at which the passages are contracted. From this toe the tar drops directly on to the red-hot surfaces of the horizontal portions of the ducts B. The lighter liquor from the outer portions of the chamber D is (as above described) carried off by a pipe C^1, which may be trapped, and the level of which with respect to the chamber C is determined. The exit passage E is maintained in a cool condition by water jackets. This passage is also provided with a toe by which matters condensed within it, in falling towards the ducts B, are caused to fall directly from the toe on to the red-hot portion on the bottom of the duct B. All cooling jackets are provided with suitable water-circulating inlet and outlet pipes.

In lieu of introducing the tar into the ducts B, in the manner just described, it may be returned from the mains, condensers, or other parts of the apparatus, and introduced by the pipes shown in dotted lines, passed into the passages D, and provided with a delivery orifice arranged in such a manner that the tar will fall directly from the orifice on to the bottom of the ducts which will be red hot.

In all cases the supply of tar to the duct B must be a regulated one, whether such supply to the duct be direct or indirect; and little or no more tar than is capable of being gasified by the duct must be supplied to it—that is to say, the quantity of tar must be regulated in such a manner that the temperature at the surface of the duct B, in or on to which the tar falls, will not be thereby reduced below an efficient gasifying point (say, a bright cherry-red colour).

As to the proportion of ducts or retorts, and the quantity of tar produced from the coal distilled in such retorts that may be introduced into the ducts, it may be said that as the size and amount of heated duct surface used and caused to act on the tar in a bench of apparatus is to the size and number of distillatory retorts or the quantity and quality of the coal distilled in the retorts and the quantity of tar produced from such coal, so will be the quantity of tar capable of being vapourized or gasified by the duct surface, to the quantity produced.

The operation and process of manufacturing gas are as follows:—The coal is placed in the retorts A, and distilled by heat in the ordinary way; and the gas evolved from the coal is passed in to the lower hot duct B of each retort, by its ascension-pipe, the cooled passage D, &c., into its trough or chamber C. In this passage and chamber it deposits part of its tar and condensable matters, such as ammoniacal vapours. It then passes under the sealing curtain, and down through the second artificially-cooled passage D, into the upper of the heated ducts B. It leaves this duct by the cooled passage E, wherein a further quantity of tar and other condensable matter is arrested or condensed. In the condition in which the gas enters the lower of the ducts B, a portion of it is not permanent; but in passing through the duct, the whole is subjected to the heat of it, and the greater part of the non-permanent portion is thereby rendered permanent. The tar deposited from the gas in the chambers C, and the tar and other liquors condensed in the passage D, together with the tar introduced, all fall down to the bottom of the ducts B, where they are gasified by the heat of the duct, and in the presence of the gas passing through such duct. The matters condensed in the cooled passage E, fall as described, into the duct B, and are gasified in the presence of the coal gas passing through such duct.

After the gas leaves the distilling apparatus illustrated, it may be conducted through a considerable length of inclined pipe, as commonly practised, before delivery to the condensing and washing apparatus; and in traversing the pipe a certain quantity of tar will be removed from the gas. This tar, as above stated, together with the tar recovered by the condensers, is brought back to the distilling apparatus by gravity or otherwise, and introduced into the hot ducts B, to be there gasified in the presence of freshly distilled gas coming from the retorts A, so converting into permanent illuminating gas.

Several modifications of the various details of the invention are described and illustrated in the specifications.

There are in all 27 claims for the invention, concerning which the patentee says: "Although I have particularly described special examples of apparatus for, and methods of producing illuminating gas in them, nevertheless, I do not bind or confine myself to the special forms of construction of the apparatus or parts thereof described; for it will be evident to those skilled in the art of manufacturing gas and making gas-manufacturing apparatus, the several details or parts of the apparatus set forth and illustrated, and the exact arrangement or disposition of them as well as their forms, may be varied without departing from the nature, spirit, or scope of the invention; and further that various combinations of parts of the several arrangements herein illustrated may be made and used to carry out this invention. Moreover I do not confine or restrict myself to any particular quantities of tar that may be introduced and gasified in the apparatus; nor the particular point or points at which its introduction into the apparatus may be made, or means by which it is introduced, or the precise mode of mixing the tar gas or vapour with the coal gas, or the part of the apparatus at which it is combined with the coal gas, as these may be, and will be varied, under varying conditions and requirements to suit such conditions or requirements. On the other hand, I wish it to be understood I do not claim the application and use generally as separate things, of a heated chamber, duct, or ducts in connection with coal-distilling retorts, or cooling passages, or broadly the making of gas from tar which has been condensed from the gas made in the apparatus, as these features, as separate things, have been heretofore proposed." What he primarily claims, however, is: "In the manufacture of illuminating gas, the herein described method of making illuminating gas from the tar condensed or recovered from gas made in the gas-making apparatus, which method consists in causing the tar to be delivered into or to fall on to the red-hot surface of, or a red-hot surface within a heated chamber, or duct, or ducts in the presence of freshly distilled gas, or through which such gas is being passed."

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

THE WEST HAM BILL—A PRECEDENT.

Sir,—The Journal of the 9th inst. contains, under the above heading, some observations on the alterations made in this Bill by the Committee to whom it was referred, which are not strictly correct. You state the decision of the Committee to have been "that the Company shall never carry forward out of the profits of any half year a larger sum than the equivalent of ½ per cent. upon the dividend-earning stock;" whereas the decision was that the amount carried forward shall in no case exceed the sum of £2500 in any half year, and no reference is made as to what that represents. At the present time a reduction of 1d. per 1000 cubic feet upon the quantity of gas consumed would alone be equal to £2411.

It is quite true to say, as you do, "this is the legislative consequence of the judgment in the Ashton case," as that was quoted again and again during the proceedings; and the provisions now in the Bill were made at the instance of the opponents, to prevent a recurrence of the proceedings exposed in that case. How far it will have that effect, your readers must judge for themselves. All that can be said about it now is that the clause is unworkable as it stands; and, with the concurrence of the opponents, will have to be reconsidered in the other House. We must not, therefore, go into any discussion about it now.

W. Livesey.

Gas Companies' Association, Palace Chambers, Westminster, April 12, 1889.

GAS EXAMINATION.

Sir,—In your remarks on "Gas Examination," in the Journal for April 9, you are mistaken in supposing that the inquiry into The Gaslight and Coke Company's appeal was the first held by the Chief Gas Examiner. On behalf of the Commercial Gas Company, I had to ask for an inquiry some two years back; on which an inquiry was held, and evidence on both sides heard. I should like to add that on this as well as on other occasions the greatest latitude has always been allowed me by the Chief Gas Examiner to bring evidence of every kind before him, and that our cases have invariably been decided, whether for or against, with the utmost conviction on my own part of the impartiality of the tribunal.

Unfortunately, the discretion given to the Chief Gas Examiner by the Act of Parliament is extremely narrow; and on the question of illuminating power the report of the Gas Examiner is practically made final. On the whole, I have confidence in the system, though I should wish that the Gas Referees played a more extensive part in the appointment of the Examiners and in the controlling of the testing-stations, furnishing materials for testing, &c.

I am far from believing that candles, with fair treatment, are incapable of giving satisfactory results, or that the substitution of any other standard will do away with the occasion for appeals and disputes.

Taking it altogether, the present system works well, and furnishes a great protection to the consumer, and not less to the Companies, in meeting frivolous and idle objections and complaints from unauthorized sources.

H. E. Jones.

Commercial Gas-Works, Stepney, E., April 11, 1889.

COUNTY AUTHORITIES AND THE LAYING OF MAINS ON BRIDGES.

Sir,—In your issue for the 2nd inst., p. 624, "Gas and Water" contends that the fact of having a water-main over an old bridge has no connection with the continuation of the supply-pipe over the new structure. Surely this is not correct. The right to lay the main having been once admitted, should be sufficient authority for its continuance and protection.

It appears to me that the error was in placing too large a main on the bridge, knowing it could not be covered. Instead of a 10-inch pipe, two 5-inch mains should have been laid side by side, and no objection could then have been made.

I have laid mains over bridges—the last being over a railway. Of course, the usual request was made to fix the 9-inch pipe on cantilevers outside the bridge. I considered that the roadway was a public highway; and the water company were compelled to supply the inhabitants with water. So when the pipe was laid up to the bridge, I put in a Y-piece, and carried two 5-inch pipes in the pavement, which is the usual practice with such small mains. The mains are there still; and no agreement was made with railway company or landowner. Large mains are either laid by the side of the structure or slung underneath; but in the case under discussion, there is no necessity for putting the company to such an expense.

The former correspondent, p. 581, did not state that his main was allowed on the old bridge on sufferance, but that it was there by right, as defined by the Water-Works Clauses Acts of 1847 and 1863; also as per section 23 of the Railway Clauses Consolidation Act, 1845, quoted in full in the Journal for Aug. 14, 1888, p. 293, and Aug. 21, 1888, p. 340. Mr. W. Livesey, of the Water Companies' Association, 76, Palace Chambers, S.W., would no doubt be able to decide the question.

If the bridge were not a public highway, it would be different, as in the case of *Maddock v. The Wallasey Local Board* (see Journal, Aug. 11, 1885, p. 251).

Not only is the right of the water company observed in the Water-Works Clauses Acts, 1847 and 1863, but similar clauses are inserted in the Electric Lighting Act, 1882; and if any dispute arise it is to be settled by arbitration.

Main Layer.

April 8, 1889.

WATER GAS.

Sir,—I have read with interest the letter from Mr. B. H. Thwaite, under the above title, in your issue of the 9th inst., and trust you will allow me space to reply to it; the subject of water gas having for a long time engaged my attention.

As had already been done in the report on water gas to which attention is drawn, Mr. Thwaite compares water gas with what may be called Siemens gas. The calculation, as given in the letter, is slightly in favour of Siemens or producer gas, but actually (owing to an error which has slipped into the calculation) it is in favour of water gas. Mr. Thwaite calculates the loss that would arise from the products of combustion of 12 grammes of carbon formed respectively into water gas and Siemens gas escaping at a temperature of 500° C. into a chimney. The reaction for water gas is

$$C + H_2O = CO + 2H,$$

and its complete combustion with air is represented by

$$CO_2 + H_2O + 8N$$

as given by Mr. Thwaite. In the case of Siemens gas, carbonic acid gas is first produced diluted with nitrogen from the atmosphere thus:

$$C + \text{air} = CO_2 + 8N$$

and this in passing through incandescent fuel takes up another equivalent of carbon thus:

$$(CO_2 + 8N) + C = 2CO + 8N.$$

The complete combustion of this gas in air is represented by

$$2(CO + 4N) + 2(O + 4N) = 2CO_2 + 16N,$$

or for as much CO as contains an atom of carbon by

$$(CO + 4N) + (O + 4N) = CO_2 + 8N.$$

Then, according to Mr. Thwaite's calculation for water gas, there will be 33,684 units of heat lost; and correcting his calculation for Siemens producer gas, the figures stand—

$$500\left[\frac{CO_2}{(12+32\times0{\cdot}217)+(8\times14\times0{\cdot}244)}\right]^{8N}$$

That is to say, 112 × 0·244 instead of 84 × 0·244, as in Mr. Thwaite's equation, or 18,438 units of heat lost instead of 15,122 units. Assuming, with Mr. Thwaite, that the units of heat produced by the combustion of the two gases are for water gas 125,208 and for Siemens gas 67,284 units, the ratio of loss in the case of the former will be

$$\frac{33{,}684 \times 100}{125{,}208} = 26{\cdot}9 \text{ per cent. (not 25 per cent.)}$$

and in the latter

$$\frac{18{,}438 \times 100}{67{,}284} = 27{\cdot}4 \text{ per cent. (not 22·4 per cent.)}$$

being 0·5 per cent. in favour of water gas; that is to say, a saving of 10 cwt. per 100 tons of fuel burnt.

This theoretical result is not cheering; but the monetary results obtained with water gas and with Siemens gas respectively in actual practice for furnace work is the point which chiefly concerns iron and steel manufacturers; and these results will alone influence them in adopting water gas or not. The prospectus referred to by Mr. Thwaite does not furnish specific particulars on this important question but in a paper read by Mr. Wilson last year at the spring meeting of the Iron and Steel Institute, he gave some indications which, being afterwards supplemented by figures of cost of water gas, enabled Mr. Frederick Siemens to write a letter published in the engineering journals about the 10th of August last. In that letter Mr. Frederick Siemens showed that to melt two tons of steel with water gas on the open hearth, and to make 140,000 cubic feet of producer gas of inferior quality (this inferior producer gas to be afterwards more particularly referred to), the cost amounted to 18s. 3d.; and that with the Siemens ordinary producer gas two tons of steel are melted on the open hearth, and 140,000 cubic feet of surplus producer gas of good quality are provided at a cost of 10s. 6d. These figures show an advantage of 74 per cent. in favour of Siemens gas, and considering the high prices taken by Mr. Siemens for coals and labour, it is probable that the advantage obtained in practice would be nearer 100 per cent. than 74 per cent.; or, in other words, to do a certain amount of work in regenerative gas furnaces with water gas, would cost twice as much as to do the same work with Siemens gas.

But there is another consideration which should not be omitted in any comparison between Siemens gas and water gas, and that is that the former is produced for a definite purpose, and only so much is made as is required for that purpose. With the water-gas apparatus, on the contrary, for two-thirds of the time during which it is at work, an inferior gas, called in the report producer gas, must necessarily be made, whether required for use or not. If this inferior gas cannot be utilized, it must be allowed to run to waste; and in that case the cost of water gas will at once rise to three times the stated cost of 4d. per 1000 cubic feet, or 1s. per 1000 feet.

At the Leeds Forge, where hand forge work has to be done requiring a high temperature to be concentrated on a small surface—in fact, a blowpipe heat—water gas will be useful, and doubtless yields the economy stated in the prospectus as compared with the town gas which it has replaced for this purpose. Water gas is also applicable for gas-engines, as deposits in the passages and valves will be avoided by its use. But, allowing everything in its favour, what will practical men say of a process in which the plant can only be used for one-third of the time in the production of water gas, whilst for two-thirds of the time it is employed it produces what in many cases will be a waste product? We surely are far from perfection here.

Gas.

London, April 10, 1889.

THE SHIPMENT OF WATER-MAINS.

Sir,—I notice in the Journal for the 9th inst. a paragraph in connection with 11½ miles of 14-inch wrought-iron pipes, weighing 1200 tons, supplied for a water-works in South America by Messrs. Thomas Piggott and Co., of Birmingham. In the first place, there is evidently an error in the note of weight said to be saved by using these pipes instead of cast-iron pipes, as the same length of 14-inch cast-iron pipes of fair weight would not come to more than 2500 tons altogether. Deducting from this the 1200 tons ordered from Messrs. Piggott, the saving in weight is only 1300 tons at most, instead of 3000 tons as claimed in the paragraph referred to. Then as to "nesting" the pipes inside others for shipment, how could they be so in this instance, as the whole main is of one diameter—viz., 14 inches? For the purposes of freight, therefore, they would have to go by measurement, as would also 14-inch cast-iron pipes if sent alone. The amount of freight would thus be practically the same in either case.

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April 13, 1889.

Parliamentary Intelligence.

HOUSE OF LORDS.

THURSDAY, APRIL 11.

SMOKE NUISANCE ABATEMENT (METROPOLIS) BILL.

Lord STRATHEDEN AND CAMPBELL, in moving the second reading of this Bill, said the measure introduced last year had been rejected under the false impression that it gave to Vestries the power to visit the interior of private houses, and that no maximum had been fixed as to the fine to be inflicted. These objections had been met in the present Bill, by reading which a second time their Lordships would only reaffirm the principle that something more was necessary to improve the air of the Metropolis than the existing statutes against the smoke nuisance.

The LORD CHANCELLOR said his objections to a great part of the Bill remained unaltered; and if, at a later stage, certain modifications were not introduced in Committee, he should move the rejection of the measure.

Earl BROWNLOW said the noble Lord had a strong argument in the terrible condition of the Metropolis on the previous day and that morning. On reading over the Bill, he found that several clauses which were objectionable had been removed, and therefore he thought the Bill was better than that which was brought forward by the noble Lord on a previous occasion. The particular provision, however, which caused the former Bill to be thrown out still remained—viz., the clause providing that private houses should be included in the operation of the Bill. He could only say that when the Bill went into Committee it would be impossible for Her Majesty's Government to support this proviso in any way. At the same time, there were in the Bill other points which, he thought, might very safely become law.

The Earl of MEATH was of opinion that, until the Government made up their minds to deal in some way or other with private houses, they never would get rid of the smoke nuisance in the Metropolis.

The Bill was then read a second time, and referred to the Standing Committee for General Purposes.

During the past week the following progress with Private Bills was made:—

Bills reported with amendments: Bristol Water Bill, Burnley Corporation Bill, Manchester Corporation Bill, Tuscan Gas Bill, Windermere District Gas and Water Bill.

Bills read the third time, and passed: Bristol Water Bill, Coventry Corporation Water Bill, Plymouth Dock (Devonport) Water Bill.

HOUSE OF COMMONS.

MONDAY, APRIL 8.

The Examiners reported that no Standing Orders not previously inquired into were applicable to the Newcastle and Gateshead Water Bill.

THE LIGHTING AND VENTILATION OF THE HOUSE.

In the Committee of Supply (Civil Service estimates), on the vote of £42,379 for the Houses of Parliament,

Mr. MACDONALD moved to reduce the vote by £500, on the ground that the House was not ventilated upon a systematic plan, and the atmosphere became unhealthy.

Mr. PLUNKET said the system of ventilation adopted throughout the building was founded on the most approved scientific principle, and was in charge of an experienced and trustworthy officer. Since last session the electric light had been fixed in certain parts of the building; and during the Easter recess it would be carried into the lobby outside, and into some other portions of the House. But he thought the Committee would hardly approve of the Office of Works undertaking a very large extension in the present state of science with regard to the electric light.

Colonel NOLAN objected to the introduction of the electric light being deferred until some conclusion had been arrived at as to the best system, because progress was always being made in electric science, and if the present Parliament were to wait for future improvements they would not be able to do anything for themselves.

Sir W. FOSTER said it was high time the House had the advantage of the best form of lighting that had been invented. He urged the use of the electric light.

Sir G. CAMPBELL (who had given notice to reduce the vote by £1500, part of the cost of gas for the Houses) also complained of the temperature, and asked for some explanation of the fact that though the electric light had been introduced into the building, the gas bill had increased.

Mr. PLUNKET said the air admitted to the House was the purest that could be drawn from the outside. With regard to the electric lighting, the reason it had not been carried out more completely was that for the next few months it was not quite clear whether they would be able to light the whole of both Houses of Parliament more cheaply by generating the electric light for themselves, or by obtaining it from some of the supplying companies. The increased charge for gas, which had been spoken of, was caused by the autumn session entailing a larger consumption, in addition to which a greater number of rooms were lighted with gas.

After some further remarks, the amendment was withdrawn.

PRIVATE BILL LEGISLATION (SCOTLAND).

A Bill to amend the procedure in regard to Private Bills relating to Scotland was brought in by the Lord Advocate, Mr. W. H. Smith, the Chancellor of the Exchequer, and the Solicitor-General for Scotland, and read the first time; the second reading being fixed for Thursday, May 2.

TUESDAY, APRIL 9.

The Examiners reported that the Standing Orders not previously inquired into in the case of the Padiham and Hapton Local Board Bill had been complied with.

THURSDAY, APRIL 11.

OIL-LAMPS IN THE HOUSES OF PARLIAMENT.

Mr. W. M'ARTHUR asked the First Commissioner of Works whether he would state the number of oil-lamps provided for in the estimate of £2000 lately passed by the House; how many of those lamps are hired; from whom they are hired; and what sum is paid for their use.

Mr. PLUNKET: The number of lamps in use in the building is between 600 and 700. Of these only 24 are the property of the Government; the remainder belonging to the contractors, Messrs. Patrick and Co., who keep, in order to meet exigencies, a large stock within the building. The charges made by the contractors cover the hiring of the lamps, the supply of oil, and the cost of lighting and trimming the lamps, including the pay of the staff of attendants who constantly inspect the lamps. The charges for such lighting are as follows:—Argand lamps, 11d. each lighting; moderators, 8d. each lighting; smaller lamps at rates varying down to 3d. each lighting. A record is carefully kept each day of the number of lightings; the total number during the past year being 60,443. The gentlemen named had supplied the lamps for a great number of years. The question of contract was gone into last year; with the view of seeing whether any reduction could be made; and some reduction, although not a large one, was obtained. He trusted that in the future there would be no need for a contract, owing to the introduction of the electric light.

During the past week the following progress with Private Bills was made:—

Bills read the first time: Bristol Water Bill, Coventry Water Bill, Edinburgh and District Water Bill, Kettering Water Bill, Plymouth Dock (Devonport) Water Bill, Wakefield Corporation Bill.

Bills read a second time, and committed: Deanhead Commissioners' Bill, Sheffield Corporation Bill, Yeadon Water Bill.

Bills reported: Faversham Gas Bill, Hythe Corporation Bill, Long Eaton and District Water Bill.

Bill read the third time, and passed: Morley Gas Bill.

A petition was presented by the Stainland Local Board against alterations in the Deanhead Commissioners' Bill; and one against the Bill, by the Corporation of Halifax.

A petition against the Newcastle and Gateshead Water Bill was presented from the Whickham Local Board.

HOUSE OF LORDS COMMITTEE.

TUESDAY, MARCH 26.

(*Before Lord* HENLEY, *Chairman; the Duke of* LEEDS, *Earl* LAUDERDALE *and Lords* ZOUCHE OF HARYNGWORTH *and* KINNAIRD.)

NEWCASTLE AND GATESHEAD WATER COMPANY'S BILL.

This Bill, by which the promoters seek to be empowered to construct additional works and to raise further capital, came before their Lordships for consideration to-day.

Mr. POPE, Q.C., Mr. BIDDER, Q.C., and Mr. C. A. CRIPPS appeared for the promoters. The opponents of the measure were represented by Mr. PEMBER, Q.C., and Mr. RICKARDS, for the Newcastle Corporation; Mr. PEMBROKE STEPHENS, Q.C., and Mr. H. SUTTON, for the Corporation of Gateshead; Mr. LEWIS COWARD, for the Tynemouth Corporation; Mr. LITTLER, Q.C., and Mr. C. BAGGALAY, for the Duke of Northumberland; and Mr. LEDYARD for the Felling Local Board.

Mr. POPE, in opening the case for the promoters, explained the object of the Bill, and went on to say that the Committee would find that there was no question of principle as to the main provisions of the Bill, but that opportunity was taken by the various opponents to seek some modification of the terms. Newcastle and Gateshead were served with water by a Company instead of by the governing authority; and this arose largely from the fact that the Company had, for a series of years, by a judicious expenditure of capital, made the public satisfied to leave the supply in their hands, and the result has been not merely to the advantage of Newcastle and Gateshead, but ultimately to that of the Company itself. Portions of the capital received dividends of 10 per cent.; a certain part received 8½ per cent.; another section was restricted to 7 per cent.; and it was proposed in regard to the new capital to limit the dividends to 5 per cent. The auction clauses were embodied in the Bill; so that the issue of new capital would be at such prices as the public might be willing to give, unlike the old principle where the issue of capital among old shareholders was a very large source of profit to them. The Company's object was now simply to keep abreast of the requirements of the district. They had control over 22,000 acres, but had storeage power for a very much larger gathering-ground. The object of the Bill was to get a further supply of pure water, which would not necessitate the expenditure of capital for the construction of new reservoirs. The Tyne above Hexham divided into two branches—known as the north and the South Tyne. The River Rede fell into the North Tyne, taking its rise in the moorlands to the north; and here the Company proposed, by means of a catchwater, to take the water of 10,330 acres at the extreme rise of the Rede, and conduct it by an aqueduct to their reservoirs. The merit of this scheme was that the Rede was perhaps the only stream of equal length in the North of England upon which there were no manufacturing interests of any kind. There was absolutely no mill, manufactory, or works with riparian rights, with the exception of one small mill, let at £20 a year, which, of course, would be purchased. The necessity for a further supply of water was abundantly admitted. The main question arose upon this: The Company had a large and increasing community to deal with; and it did appear to them that, as they were the Newcastle and Gateshead Water Company, the populations of those two places ought to be their chief care. There were two main questions—one that, whereas the Company were at present supplying the North Shields Company with a certain amount of water in bulk, they did so voluntarily; so that in fact the population of Newcastle and Gateshead would retain the first claim upon the water. He believed that one of the questions would be whether they ought or could come under a compulsory obligation to give North Shields water which it was possible the population of Newcastle and Gateshead might require. He believed the Duke of Northumberland's petition was the one upon which this proposition mainly arose. The second question arose thus: With the borough of Gateshead his clients went before Parliament, and incorporated with their Acts the Water-Works Clauses Acts, which provided for constant service, with penalties. But, inasmuch as the district was peculiar in its formation—Newcastle and Gateshead rising precipitately from the Tyne—380 feet had been fixed as a restricted height; and, by section 70 of the Act of 1854, exemption was given for heights above that figure. In 1863 this exemption was continued; and in 1876 further parliamentary powers were obtained; and Gateshead suggested that the responsibility should be taken of serving the district of Sheriff Hill and Wrekenton, which were not an improving part of Gateshead, but a quarry district, and terms were embodied in section 13 of the 1876 Act. The Corporation of Gateshead now came and asked that the whole matter, as settled in 1876, should be repealed; and, when they wanted to destroy that bargain, he (Mr. Pope) could not see the fairness of the proposition. He thought they might be trusted to make an equitable bargain; but they could not be called upon to make provision for a further district of Gateshead when other districts required it more. With respect to the Duke of Northumberland's petition, his Grace petitioned that he was the owner of a large property affected in North Shields, and that no certain provision existed at present for securing the water supply of North Shields, which depended upon the good will of the Newcastle Company.

Evidence was then called in support of the Bill.

Mr. *A. Potter*, examined by Mr. BIDDER, said he was formerly Mayor of Newcastle, and now an Alderman and Magistrate, a member of the Tyne Commission, and Vice-Chairman of the Water Company. The population of the district was increasing at the rate of 2½ to 3 per cent. per annum; if anything, Gateshead was increasing faster. An engineer's report had been made, expressing the opinion that the Company were now provided for another five years. This report had been confirmed, and engineering advice had been taken as to the best means to provide for the future; hence this Bill.

Mr. *Thomas Hawksley*, C.E., examined by Mr. POPE, said he considered that the addition of the proposed new drainage area on the Rede

would enable the Company to meet the district's wants for 20 or 25 years to come.

Cross-examined by Mr. BIDDER: There was nothing to prevent Shields getting water for itself, if it liked, at a reasonable cost.

WEDNESDAY, MARCH 27.

Mr. *G. Smith*, Secretary of the Newcastle Water Company, examined by Mr. CRIPPS, said that in 1886 the North Shields Water Company came to them for an increased supply; and it was agreed to increase it from 15 million gallons to 159 million gallons—more than tenfold. There was, however, no parliamentary obligation to supply; and if the balance in hand were less than 500 million gallons, it was not compulsory that they should supply North Shields with any water. The Newcastle Company had incurred considerable outlay to provide for the wants of North Shields.

The CHAIRMAN: North Shields put itself in a rather worse position, as to the balance of storeage, by the agreement of 1886. What did they get in return?

Witness said that was not quite so, because the storeage power was increased.

Mr. CRIPPS explained that the agreement come to in 1886 was the only obligation that existed on the Newcastle Company to supply the North Shields Company.

Examination continued: As to Gateshead, the Company had a limit of height, in their Act of 1884, of 380 feet, above which they were not bound to supply. In the Act of 1884 the Water-Works Clauses Act was first introduced, requiring them to give a constant supply; and Gateshead could obtain a constant supply above the height mentioned if it would carry out the terms of section 13 of the 1876 Act. The Water Company always had been on their part willing to carry this out.

Cross-examined by Mr. SUTTON (for the Gateshead Corporation): In 1876 his Company were paying a dividend on the consolidated stock of 6 per cent., which rose to 8 per cent. in 1884; and it now stood at 8½ per cent. The total capital upon which this was paid was £388,390. The 1876 capital was limited to 7 per cent. dividends; and £5 19s. was paid in 1888 on £320,005. The rest of the capital was £211,605 of 5 per cent. preference stock, and £211,695 of 4 per cent. debenture stock—the total capital being £1,131,695. For the year ending February, 1888, the gross revenue was £84,619, and the net revenue £65,288. They carried forward a profit of £3500. The corresponding figures for the year ending February, 1889, were: Gross revenue, £87,133; and net revenue, £668,577. They paid an increased dividend, and carried forward £5117. If they supplied the higher districts on the same terms as the lower, the Company would lose £300 to £400 a year. The receipts would not pay the cost of collection—not much more; and there would be the rates and taxes to be paid by the Company.

Mr. SUTTON remarked that his argument in this connection was that in 1876 the financial position of the Company was very different from what it was now; and had the financial position of the Company been as good in 1876, the bargain with Gateshead would never have been made.

Cross-examination continued: Above the 880 feet limit there were 1040 houses of less than £10 rental, and 70 houses above that rental. If every tenant took the water, there would be a revenue of £295, at about 5s. a house. The estimated cost of the necessary works was £10,000; and 5 per cent. on that (£500) and cost of collection and other things would come to £770. Deducting the revenue of £295, there remained a loss of £475, without giving anything for the water.

Cross-examined by Mr. CLAUDE BAGGALAY as to the agreements with the North Shields Company, witness said that in 1876 the minimum of 200 million gallons to be in hand before Newcastle supplied Shields applied to two specified reservoirs. In 1886 it was raised to 500 million gallons.

Mr. BAGGALAY: In your opinion, is there anything to prevent an agreement being entered into by which the North Shields Company shall be entitled to water from Newcastle until there is only 200 million gallons left in those two specified reservoirs?

Witness: No.

Mr. BIDDER: It does not agree with my opinion.

The CHAIRMAN: Mr. Smith said that the agreement of 1886 applied to all reservoirs. This clause will put the North Shields Company in a somewhat worse position than they were in in 1886.

Mr. BAGGALAY: We shall argue that 500 million gallons applied to specified reservoirs, means a great deal more; and there is no such limit at the present time.

The CHAIRMAN (to witness): Would not the loss of supplying the higher places fall upon the Corporation of Gateshead?

Witness: It would fall on the Company if there were no guarantee. The Company would be willing to supply water at once if there were a guarantee.

But the Corporation do not like to face the loss?—That is what stopped the supply.

Do you think that if the terms of the clause were modified so as to make the loss less heavy, that the Corporation would take steps in the matter?—The Company have offered to modify them.

Mr. BIDDER said that the Company would be sorry to think that any sanitary requirements should not be supplied; and they were willing to make the 10 per cent. 5 per cent.

The CHAIRMAN (to witness): Owing to the clause portions of the townships in your area are not supplied—is not that so?

Witness: Not to a large extent.

Mr. BIDDER informed the Committee that the clause with reference to the North Shields supply should be altered so as to apply the minimum of 500 millions to all the reservoirs. This included the new supply.

This concluded the case for the promoters of the Bill.

Mr. PEMBER briefly addressed the Committee for the Corporation of Newcastle.

Mr. STEPHENS spoke on behalf of the Gateshead Corporation; and expressed the hope that the Committee would not allow the clause which had worked so unsatisfactorily to remain any longer.

Mr. *A. S. Palmer*, the Chairman of the Felling Local Board, and Mr. *Bolam*, the Clerk to the Board, were briefly examined as to the insufficient water supply of the district.

THURSDAY, MARCH 28.

Mr. LEWIS COWARD addressed the Committee on behalf of the Tynemouth Corporation. He hoped that their Lordships would see that the district was ensured a sufficient supply.

Mr. LITTLER, on behalf of the Duke of Northumberland, said it was argued that Shields should remain in the desert, because it had placed itself there; but the Duke wished to extricate it.

Mr. POPE, then replied upon the whole case for the promoters.

After the Committee had deliberated in private,

The CHAIRMAN said the Committee had resolved (and it was a unanimous resolution) that the Bill would proceed with the following proviso:—That the high-level district in Gateshead and the Felling Local Board should be supplied with water on the same terms as the rest of Newcastle and Gateshead.

FRIDAY, MARCH 29.

The Committee met to-day for the purpose of deciding upon the form of the clause for the supply of the high portions of Gateshead; and, after some discussion, they accepted the one submitted by the promoters, which was as follows:—"Section 13 (as to supply of Gateshead above the level of 380 feet) of the Act of 1876 is hereby repealed; and section 104 (as to service beyond a certain elevation) of the Act of 1863 shall not apply to Nether Heworth, in the county of Durham, nor to that part of the borough of Gateshead which is situated more than 380 feet above the level of an ordinary spring tide at Newcastle."

HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, APRIL 3.

(*Before Sir* J. PEASE, *Chairman; Mr.* HUGH ELLIOT, *Mr.* SETON-KARR *and Mr.* TUITE.)

WEST HAM GAS BILL.

Mr. BALFOUR BROWNE, Q.C., and Mr. CRIPPS appeared for the promoters; Mr. PEMBROKE STEPHENS, Q.C., Mr. CLIFFORD, and Mr. Fitzgerald for the Leyton Local Board, the only petitioners against the Bill.

Mr. BALFOUR BROWNE, in opening the case for the promoters, said the Bill sought to empower the West Ham Gas Company to raise additional capital for the purposes of their undertaking. He believed that, as the result of an adjournment of the consideration of the Bill granted by the Committee a few days previously, one of the most important opponents—viz., the Corporation of West Ham—had withdrawn; and the only opponent left was therefore the Leyton Local Board, who would raise certain questions of intricacy and importance for consideration. The history of the Company was very remarkable. It was incorporated in 1856 for the supply of West Ham and other districts with gas. It had an authorized capital of £80,000 in 16,000 shares of £5 each; and borrowing powers to the extent of about £20,000. In 1869 it was found that the capital had been practically exhausted. In that year the Company again came to Parliament, and were then empowered to raise a further sum of £150,000, and to borrow £37,000. So that at the present time their powers amounted to £230,000 share capital and £57,000 borrowing powers. The capital account of the Company in June, 1888, showed that they had borrowed the whole £57,000, and had called up £215,000 out of the £230,000 of share capital. In December, however, the Company called up the remaining £15,000; so that their whole capital powers were exhausted. He did not think his friend would dispute that some further capital was absolutely necessary; but he saw from their opponents' petition that they said the Company were asking for too much. He should be able to show, however, that under recent gas legislation, which had been adopted by the promoters under this Bill, the real amount of the capital sought to be authorized was a matter of comparative unimportance to the consumers of gas. Their object was to raise for the purposes of new works a sum of £250,000 in share capital, and one-third of the total amount of share capital by borrowing, which would amount to £160,000. But as they had already borrowed £57,000, the Committee must deduct that amount, which would leave the amount to be borrowed £103,000. This added to the £250,000 of share capital, made a total of £353,000 which was sought to be raised under the Bill. This was a large sum; but he should call gentlemen of considerable experience, who knew the district well, and they would state that the money would not suffice for more than probably ten or eleven years from the present time. Now, there had come into vogue in recent years a totally different code with reference to gas companies. Formerly all capital was raised under the Gas-Works Clauses Act of 1847; and Parliament, with the view of looking after the interests of the consumers of gas, limited the amount of dividend that was to be paid on capital, and also determined the maximum price the companies might charge. But in allowing companies to raise further capital, there was one important matter which Parliament permitted them to do—viz., to distribute the newly-created shares amongst the proprietors at par. So that a company like the present, in raising further capital would have had leave from time to time, as the requirements of the company rendered it necessary, to distribute the shares amongst the proprietors at par, although probably the shares were at 100 per cent. premium in the market at the time. Parliament saw that this was too much premium to allow the shareholders; and so they enforced upon all gas companies asking for new powers what were called the "Auction Clauses." Consequently, when new capital was raised, companies were not now allowed to distribute it amongst the shareholders at par, but had to offer it for sale by public auction, and all the premium thus obtained went into the capital of the concern, and was not allowed to bear any dividend. So that practically at present the shareholders had every interest not to increase the capital beyond its existing amount; and the less capital spent, the better for existing shareholders. The last Act obtained by the West Ham Company was in 1869; but two years later an important General Act—the Gas-Works Clauses Act, 1871—was passed, under which great advantages were ensured to the consumers. But although the West Ham Company were not under this Act, they had acted practically as if they were; and the consumers had received all the benefits which they would have derived had the Company deferred their 1869 application until 1872. The necessity for the present Bill was due to the marvellous increase of the population in the district of supply, which had doubled in the last seven years; and from 1857 down to 1888 the consumption of gas had simply increased by leaps and bounds. In 1857 they sold 39,178,000 cubic feet; but in 1888 the sale had risen to 578,747,390 cubic feet. This was somewhat extraordinary in the history of gas undertakings; and he did not think there was another company which had a similar record. West Ham at present had a population of over 200,000 persons; and the district of supply was rapidly increasing. If he could show that this increase was likely to continue in the future, he should have made out a case for the Bill so far as the capital was concerned. During the whole of this time the Company had done their duty to the consumers. They had increased the illuminating power of the gas from 14·9 candles in 1886 (14 candles being the illuminating power fixed by their Act) to 16·5 candles in 1888—a better article by nearly 2 candles. If the increase continued, it was estimated that the total amount of capital that would be absolutely required in the next ten years would be £324,000. But whilst the Company had been increasing the illuminating power of their gas, they had been reducing the price. In 1869, when they were last in Parliament, the price of gas was 4s. 6d. per 1000 cubic feet. In 1870-1 it was reduced to 4s. 3d.; and a gradual reduction had gone on until it now stood at 3s. His friend might say that there was an inducement to reduce the figure to 3s. 9d., because in the Act of 1869 the Company were not allowed to distribute a 10 per cent. dividend until the price reached this sum. But since then the Company had not had any further inducement to lower the price; yet the reduction had gone on. Again, as showing the necessity for further capital, he would point out that in 1869 the rental amounted to £22,274, and the dividend was 7½ per cent. When the Company reduced the price

in the period from 1872 to 1882, to 3s. 9d., it enabled them to pay 10 per cent. In 1888 the rental had gone up to £78,388; the price of gas being 3s., and the dividend paid 10 per cent. He would not refer to the balance-sheets of the Company further than to remark that they emphasized the fact that further capital was required if the increased rentals were maintained. He had now something more to say with reference to recent legislation. Formerly, the consumers of gas were protected in the matter of dividend by the Gas-Works Clauses Act; but this was not found to work satisfactorily. There was only one case in which the machinery prescribed by that Act had been tried—viz., the Ashton-under-Lyne case.* When the auction clauses were introduced, an entirely different system with regard to dividends was also established. The maximum rate was done away with, and an arrangement made under which the consumers and shareholders might have some interest in common. [The learned Counsel explained the principle of the sliding scale.] This was the principle the Company had adopted in the Bill. Their capital would be raised under the auction clauses; and all dividends upon it would be determined upon the sliding scale.

The CHAIRMAN said the petitioners alleged that the Company were authorized to pay 10 per cent. when the price of gas was reduced to 3s. 9d.; but that, notwithstanding this, the price had long since been below that figure, and yet the 10 per cent. was still paid.

Mr. BALFOUR BROWNE said he was, of course, speaking with regard to the future. In 1869, when the Company were in Parliament before, there was no such thing as a sliding scale, and there was nothing to compel the Company to reduce the price of gas below 3s. 9d. per 1000 cubic feet, or to abstain from paying 10 per cent. dividend as long as they could secure it. Had the sliding scale been included in the Act of 1869, the Company would now have been paying 12½ per cent. In order to get a single penny beyond the 10 per cent., they would now have to reduce the price of gas below 3s. The petitioners alleged that the capital sought was excessive; but he had shown that it would not be raised unnecessarily, and the Company's sole object in taking capital powers so large was to obviate the expense of coming to Parliament again very soon, seeing that the expense of this process really fell upon the consumers ultimately. He agreed that gas companies ought not to be allowed to remain too long away from Parliament, because no doubt their periodical appearance was a valuable check; but the question was how long the Company should be out of Parliament. The Committee would hear from the witnesses that the proposed capital would carry the Company on for ten or twelve years; and the question for the Committee was whether or not this was too long a period. The next objection urged was that the Company proposed to raise their capital at 10 per cent. instead of 7 per cent.; but in recent Acts of Parliament a great many companies had raised capital beyond 7 per cent. At first sight it would seem that the 10 per cent. was of benefit to the Company, but he was going to show that the promoters were asking that the capital should be at 10 per cent. in the interests of the consumers themselves. All this capital was to be placed in the market under the auction clauses, and it was obvious that 10 per cent. would get a larger premium than 7 per cent. capital. Both would be sold to return the purchaser 5 per cent. So that £100 of 10 per cent. stock would be sold to get £200; and £100 of 7 per cent. stock, to get £140. But the £10 of 100 per cent. stock would produce for the Company £100 of capital in respect of which no dividend would be paid; whilst on the £100 of 7 per cent. stock only £40 would be so received. Again, so long as the standard dividend and standard price of gas remained the same, there would be no damage to the consumer; but whenever the sliding scale upwards came into operation, the consumer would lose on the 7 per cent. stock, but would gain on the 10 per cent. stock. So that on both grounds he contended that the consumer would derive most advantage from the 10 per cent. stock. He acknowledged that hitherto the principle sought to be set up by the Bill had not been admitted by Parliament into legislation; but he asked the Committee to do it in this case, not in the interests of the people of West Ham, but because the engineers were strongly of opinion that it would be for the benefit of the consumers. The petitioners pointed out that if the price of gas was increased, the 7 per cent. stock would be more advantageous to the consumers. But as a matter of fact, not a single gas company which had the sliding scale had increased the price of gas, and he did not think there was any prospect of the present Company doing so—the probability being that the price would be still further reduced. Then the proposed reserve fund was objected to. But the Company limited it to £5000; and it was provided that no increase in the price of gas should take place until such fund had been exhausted. Moreover, the fund had to be created in the first place out of moneys otherwise applicable to dividend. Then the petitioners wanted a testing-place in their own district; but inasmuch as the promoters had agreed to provide such a testing-place for West Ham, and the gas to Leyton would pass through this place, this claim of the Leyton Local Board was unnecessary.

The CHAIRMAN: What is the value of the Company's shares?

Mr. BALFOUR BROWNE said the £5 shares were sold for £11 or £12. The Company sought to raise only one-third of the total amount by borrowing; and, as a rule, one-fourth was allowed by Parliament; so that in this respect the Company were making a concession.

Mr. *E. H. Thorman*, Engineer of the Company, examined by Mr. BALFOUR BROWNE, corroborated the statements made by the learned gentleman in his opening speech. He also said he knew of no other gas undertaking which had increased in such enormous proportions within the same time as his Company. He estimated that if the same increase went on in the next ten or fifteen years; the Company would have to spend £254,000 or £255,000 on capital account. The present works were only sufficient to meet one year's increase.

In cross-examination by Mr. PEMBROKE STEPHENS, witness admitted that the amount of capital asked for was unusual, though he thought such a question should not be put to an Engineer. The Company had had to spend £60,000 on works during the last two years; so as to supply the demand for gas. The cause of the reduction in price in the past was the 10 per cent. limit, the full reserve fund, and the operation of the old Act; and, personally, he should have preferred to have left the present system alone, without the adoption of the sliding scale. A good many alterations had been made in the Bill to satisfy the West Ham authorities, but they could not please everybody. The largest make of gas in 24 hours by the Company was 3,120,000 cubic feet; and this occurred last year. They could store about 3 million cubic feet. He had no objection to the surface of either the old or the new roads being traversed by a steam-roller, if the foundations of the roads were properly made—not composed of any "jerry" builders' refuse. There was not a single instance in which a gas company had ever raised their prices under the sliding scale.

Re-examined by Mr. CRIPPS: The Company objected to become responsible for damage done through the roads being imperfectly made. The West Ham Corporation were satisfied with the alterations made in the Bill.

By the CHAIRMAN: The capital expenditure during the last two years was about £61,000, of which about £45,000 was for enlargement of the works, and £15,000 for new mains. He had not formed any definite opinion as to the proportion of the new capital that would be expended on these two matters respectively; but he thought about £80,000 would be spent on mains in the next ten years. They could not do this without materially adding to their works; and during the last decade three new gasholders had been put up. The consumers drew away in the period of 24 hours all the 3¼ million cubic feet of gas he had named, and in the event of any great public illumination there would be a stress upon the Company, which they would have to meet the best way they could.

By Mr. CRIPPS: In his estimate showing how the share capital now proposed to be raised would be spent during the next ten years, he had not made any allowance for contingencies.

Mr. *Corbet Woodall*, C.E., examined by Mr. CRIPPS, said he considered the Bill to be a very fair one, and the proposed additional capital reasonable in amount. He estimated that it would be sufficient to meet the wants of the Company for the next twelve or fifteen years. The Company had had an abnormal rate of increase in their business. In 1858 the quantity of gas sold was 44 million cubic feet, in 1868 it was 180 millions, in 1878 it was 225 millions, and in 1888 it was 578 millions; the percentages of increase being on the last three decades respectively 141, 105, and 156. During the last five years the increases had been at the rate of 13, 11, 6, and 8 per cent. In his opinion the increase was likely to be maintained. His reasons for thinking the capital proposed a reasonable amount were these: Assuming the rate of increase for the next twelve years to be the same as during the past ten, he made out the total capital of the Company would at the end of that time be £770,000; but with the existing capital and that now asked for, it would only be £640,000. The present capital was £287,000, and the quantity of coal carbonized was 25,700 tons, or a capital of £5 3s. per ton of coal carbonized. He believed the proportion of capital to business would diminish as the business increased; and therefore he had taken it at £5 per ton. If the present rate of increase went on, in the year 1900 the quantity of coal carbonized would be 155,463 tons; and taking this at £5 per ton, the capital worked out to £770,000. He thought it would be seen that the money had been wisely expended in the past. In 1879 the capital per million cubic feet of gas sold was £681; now it was £558—showing that although a large sum had been laid out, it had been spent for improving the gas. The capital per ton of coal ten years ago was £6 11s.; now it was £5 3s. The capital of the Metropolitan Gas Companies for the year 1887 was £5 14s. 3d. per ton of coal carbonized; that of the Suburban Companies, £6 7s. 10d. per ton—the West Ham Company's being £5 3s. Whenever gas companies applied to Parliament, they almost invariably adopted the sliding scale, as now proposed. It offered inducements to a company to act prudently and economically, and to share the advantages under the auction clauses between themselves and the consumers. The standard price of gas was fixed at 3s. in the Bill; and, under the operation of the sliding scale, if there was a reduction of 1d. per 1000 cubic feet in the charge for gas, the consumers would save £2200 before the shareholders could benefit to the extent of £575. The rate of dividend suggested in the Bill—viz., 10 per cent.—was not the customary rate, which was 7 per cent.; but he believed that the higher rate would have the effect of bringing a smaller amount of dividend-bearing capital under the influence of the sliding scale.

Mr. CRIPPS: You adopt Mr. Balfour Browne's statement as to the effect of the 10 per cent.?

Witness: Yes; and I believe that under the sliding scale it will be better for the consumers than the 7 per cent.

Examination continued: The Company proposed to strike away the insurance fund of 10 per cent. on the old capital allowed by the Act of 1847, and to create out of it a reserve fund which would be limited to 5 per cent. on the capital. This would be an advantage to the consumer, as he might have had to pay for the creation of this fund. He had carefully considered the opponents' petition, and did not think the Company should submit to any modification of their scheme, as they had agreed that the price should be 3s. per 1000 cubic feet. His own feeling was that a company should do everything in their power to show that they were carrying out their obligations; but as all the gas going to Leyton had to pass through the testing-place at West Ham, it seemed unnecessary to have a second testing-station.

Mr. CRIPPS stated that the promoters were quite willing that it should be made clear, as he thought it was by a former Act, that the Leyton Local Board should have access to the existing testing-place.

Cross-examined by Mr. FITZGERALD: The last Act was obtained by the Company in 1869; and he thought that from ten to fifteen years should be the period during which a gas company might abstain from applying to Parliament. But the occasion for going to Parliament was not nearly so great now, under the operation of the sliding scale, as it was when the General Act of 1847 was obtained. Of course, contingencies might arise which were not contemplated at present. The capital obtained by the Company in 1869 was only £187,000. He was clearly of opinion that, this amount having lasted for twenty years, £353,000 would only last from twelve to fifteen years, because the rate of increase of this Company's business was so rapid, and it was a compound rate. It would be noticed that the twenty years before 1869 did not require half of the capital needed in the next twenty years. The increase of business did not depend merely on the rate of the increase in the population, but also on the additional consumption of gas generally. This was the case with the Commercial Gas Company.

Mr. FITZGERALD: You believe that the standard rate of 10 per cent. on the new capital will not be injurious to the consumer?

Witness: On the contrary, it will be advantageous to him.

Beneficial or injurious, it is not the practice of Parliament to allow it?—It has not been.

Can you cite a single instance in which Parliament has allowed 10 per cent. to be the standard rate of dividend upon new capital within recent times?—The Gaslight and Coke Company had 10 per cent. on their special issue of capital.

But since then can you cite an instance in which Parliament has allowed a 10 per cent. standard rate upon new capital?—No.

And I have no doubt you are aware that in the Model Bill, the clause with reference to the raising of new capital provides expressly for 7 per cent.?—That is so.

Then we may take it, may we not, that the invariable practice of Parliament has been to limit the rate to 7 per cent.?—Yes.

And this is an attempt to induce the Committee to do something which no Committee has done before?—You may put it in that way; but I can see no reason why the Committee should not do what has never been done before, if it is beneficial.

At any rate, it is only right that the Committee should know that it is entirely novel?—Oh, yes. I do not think it can be emphasized too strongly that it is to the interest of a gas company to raise their money as cheaply as they possibly can; and it is only from this point of view that the suggestion of 10 per cent. has been made.

And this was the view Parliament took when it put 7 per cent. in the Model Bill?—No; it was the maximum rate for new capital at the time when the sliding scale was adopted.

* See JOURNAL, Vol. XLV., pp. 160, 205; and Vol. XLVII., pp. 449, 741.

But the market value of the stock will vary with different companies?—Certainly. With one company 7 per cent. may be as good as 10 per cent. with another.

Cross-examination continued: The Gaslight and Coke Company charged 2s. 6d. per 1000 cubic feet; but their standard price was 3s. 9d. The quantity of gas sold by that Company was 32 times greater than that sold by the West Ham Company. The present price of gas per 1000 cubic feet charged by the Lea Bridge Gas Company was 4s. 6d. per 1000 cubic feet. He must say that Leyton was too far from the West Ham Gas-Works for a second testing-place to be erected there. The usual distance was about 1000 yards from the works; and Leyton was 1½ miles away.

The CHAIRMAN: You think that if the stock was issued at 10 per cent. it would sell at 100 per cent. premium?

Witness: I am sure it would.

That would give you £500,000?—No; the capital, including the premium, must not exceed the sum Parliament sanctions.

Mr. *Alfred Lass*, F.C.A., said the statements he had prepared showed that all the capital of the Company had been expended, with the exception of £1338. According to his estimate, looking at the past history of the Company, they would use up the capital they now asked for by 1898.

Cross-examined by Mr. FITZGERALD: He based his estimate of the consumption of the proposed capital on the increase of business in the last ten years. There might have been only an average increase, during the past four years, of 7½ per cent.; but they usually based their estimate on ten years' business.

Mr. CRIPPS pointed out that the average yearly increase during the past four years was 9·2 per cent.

Witness said the estimate of increase for the last ten years was about this percentage; and on that he had based his calculation.

In reply to the Chairman, Mr. FITZGERALD said the petitioners did not allege that the population of the district was at a standstill; but they urged that its development must be less rapid in future, as the locality was nearly all built upon.

THURSDAY, APRIL 4.

On the resumption of the inquiry to-day,

Mr. *L. Angel*, C.E., Borough Engineer of West Ham, was examined with regard to the steady and extraordinary growth of the district of the promoters' supply. He expressed the opinion that the growth would go on. East Ham was within the Company's district, and he mentioned incidentally that this district was maturing a great sytem of drainage for the purpose of meeting the sanitary requirements of the rapidly increasing population.

Mr. CRIPPS: Do you think that statistics with regard to the requirements of capital based upon the increase of population during the last ten years would be a good test as to any future increase?

Witness said he thought so. The Company had put up many new works during recent years; but they had not been sufficient to keep pace with the development of the district.

Cross-examined by Mr. CLIFFORD: More than a third of West Ham was yet uncovered with houses; and he believed the present development would continue for ten years. He did not know whether this justified an increase of 227 per cent. in the capital of the Company; but he did know that for years the Company had not kept pace with the development of the district.

Mr. *Woodall* (recalled) said, in answer to Mr. CRIPPS, that he could not think of any instance in which two prescribed testing-places had been provided with reference to one set of gas-works. Under the general law, local authorities had the right of access to the place prescribed for testing the gas.

The CHAIRMAN: Supposing the gas was found to be perfectly pure at a distance of 1000 yards from the works, does it follow that at 3000 yards away its quality would be the same?

Witness said he thought it would. The experience of The Gaslight and Coke Company, who sent their gas ten miles, was that the loss of illuminating power was almost *nil*.

The CHAIRMAN: What is the distance of Leyton from the testing-place?

Mr. CRIPPS said it was about 2½ miles from the works.

The CHAIRMAN: I suppose there would be no material loss of illuminating power in that two miles!

Witness: I should think not.

The CHAIRMAN: There would be a loss of pressure?

Witness said that would depend upon the level of Leyton. If Leyton was higher than West Ham, the pressure would be more. The Act prescribed that there should be a minimum pressure always maintained; and this would be amply sufficient for testing purposes.

This was the case for the promoters.

Mr. *J. Gallali*, Chairman of the Leyton Local Board, was then examined by Mr. CLIFFORD for the opponents. He said he did not think it possible for the contemplated development of the district of supply to go on; and therefore the proposals of the Bill could not be justified. The Company were seeking to withdraw themselves from the control of Parliament unduly. Being asked his view as to the merits of the 7 per cent. and 10 per cent. capital proposed to be raised, he said the figures given by the Company were not correct. There was one thing which was disastrous to the whole calculation. They said they wanted £250,000, but would only issue shares to the value of £125,000 in order to get it; in other words, they would get £125,000 as premium, on which they would not have to pay any dividend. Now this £125,000 invested in the works would produce 10 per cent.; and this important fact had been left out of the calculation altogether, because, in reality, this £125,000 premium would enable the Company to pay 2 or 3 per cent. more. The petitioners therefore preferred that the capital should be raised at 7 per cent. In the case of the 10 per cent. capital the shareholders would benefit to the detriment of the consumers; but with a 7 per cent. capital the sliding scale would come into operation in a more forcible manner, because the Company would endeavour to get more than the 7 per cent. dividend, and as the dividend went up the price would go down. He believed the Company were now going to limit the amount of reserve to be carried forward, which was not done in the Bill at first; and they were willing to accept the limitation, though he was of opinion that it had a tendency to nullify the effect of the sliding scale, because if they did not divide the sum so carried forward amongst the shareholders, they would have to reduce the price of gas. The want of a testing-place had given them trouble for many years; and the gas supplied by the Company had been found most defective in point of illuminating power. He did not think the testing-place to be provided at West Ham would meet their objection. They insisted on the importance of a testing-place of their own. They also asked that the pipes of the Company should be laid at such a depth as would protect them from injury by steam-rollers.

Cross-examined by Mr. CRIPPS: If the Company raised the capital proposed, they would get £125,000 premium, on which they would have to pay no dividend. But surely this sum of money would fructify by being used, and 0 per cent. on that would mean £12,000 a year, which would certainly go to increase the dividend on the £230,000 of old capital and on the additional capital they proposed to raise. Unquestionably it would be most beneficial to the Company.

Mr. CRIPPS: Do you not know that under the sliding scale the benefit derived by the Company from a good financial operation is divided between them and the consumers?

Witness said that naturally this would be so, but there were two or three things affecting it. They considered that when a Company was paying 10 per cent. they would not be so anxious to pay more as they would be if they were paying only 7 per cent.

You have admitted that it would be an advantage to the Company?—Certainly not, because on £125,000 premiums there would be no dividend. Again, the Company increased the insurance fund.

The CHAIRMAN: Do you know that the insurance fund is limited by the Bill, and that the Company now propose to limit the amount carried over.

Witness said he did not know of that until the previous day.

The CHAIRMAN: And that the reserve fund is to be brought down to one half? Does not that limit your views?

Witness said he should like to know what was to be the limit of the sum to be carried over before he answered that question.

Mr. CRIPPS: Even if there had been no limit, the Company would not get any advantage by carrying over a larger sum than was necessary. Their object would be to get as large a dividend as possible.

Witness said they considered there would be a greater tendency to economy if the dividends were 7 per cent., because the desire would be to pay a larger dividend, and therefore the consumers would get a greater reduction in the price of gas. The 10 per cent. dividend would not carry with it that stimulus to economy or to the reduction of rentals.

Do you not think the shareholders would be equally keen to raise the dividend from 10 to 11 per cent., as from 7 to 8 per cent.?—This was not a question for the shareholders, but for the Company.

Cross-examination continued: He believed the Company would pay a larger dividend in the future; but still he did not think it would be a greater advantage to raise the capital at 10 per cent. Whilst it would be beneficial to the Company, the petitioners did not consider it would be so beneficial to the consumers.

The CHAIRMAN: If this is going to be a good paying Company, is it not much better to raise the capital in the way proposed than at 7 per cent.—the consumers of gas getting a larger proportion?

Witness said this was not his opinion. The figures might show that—they were very well put together; but the matter of the premium not bearing any dividend was put entirely out of the question.

Mr. *E. Bare*, Chairman of the Highway and Lighting Committee of the Leyton Local Board, insisted on the importance of the testing-place being conceded to the petitioners. He also urged that there was a prospect of gas dividends going down, having regard to the electric light and an increased charge for coal.

Mr. *W. Dawson*, C.E., Surveyor to the Leyton Local Board, gave evidence that building operations decreased in Leyton last year to 540 houses. The ground was practically all built upon with the exception of certain residential estates which had not yet come into the market. He did not think there was any prospect of any further substantial increase in the next few years. The great bulk of gas-mains were laid in their district. They were afraid to use steam-rollers lest they should damage the mains; and he thought it only reasonable that local authorities should be relieved of this liability. The testing-place at West Ham would be at a considerable distance from Leyton, and the Board deemed it only reasonable that they should have a station nearer home.

Mr. *J. Bressay*, Surveyor of the Local Board of Wanstead, gave evidence to show that the increase of this district was not likely to continue at the previous and existing rates.

Mr. *R. P. Spice*, C.E., said he had examined the capital clauses of the Bill, and he had come to the conclusion that the amount asked for was largely in excess of what was usually granted to gas companies, so far as an estimate could be made. The limitation which prevailed in parliamentary practice was that provision should be made for ten, twelve, or at the most fourteen years. Looking at the balance-sheets of the Company, he had formed the opinion, without visiting and examining the works, that the sum of £353,000 asked for would cover a period of something like a quarter of a century. In 1887 he saw that the sum of £37,425 was added to the capital expended; and in 1886 the amount of capital spent had been £224,841. As matters stood at the beginning of 1887, the capital worked out to £4 18s. 2d. per ton of coal carbonized; and the expenditure incurred in 1887 amounted to £11 3s. per ton on the increased quantity of coal carbonized. This went to show that the outlay in 1887 must have provided for the wants of the next two or three years at least. In 1888 this was followed by a further expenditure of £23,844, which would show the same thing in a smaller degree. They had a larger expenditure than was wanted for the increase in that year. These facts enforced his view as to the number of years over which the capital asked for would carry the Company. The total expenditure of capital for ten years was £143,000, which gave an average of £10,000 a year. With regard to the further increase of consumption, he believed gas companies in the future would have to deal with the competition of cheap mineral oil. It would enter into competition with the Gas Company in a district like West Ham; and he did not think the great rate of increase in the consumption of gas would therefore go on. He did not consider the electric light would form so formidable a competitor in a district of supply like that of the Company. Under these circumstances, he had arrived at the conclusion that the proposed increase of 227 per cent. was not justified, and was largely in excess of what would really be wanted. With regard to the 7 per cent. and 10 per cent. stock, in his opinion Parliament should not be asked in any special instance to depart from the principle of 7 per cent. which it had established. He did not know of any exception where Parliament had departed from this principle. He knew from his own experience that 7 per cent. stock would fetch a premium of 60 per cent., and that it was a more popular stock than 10 per cent. stock. His experience also showed him that the two stocks were not issued at the same premium. The 7 per cent. clauses were found to work well; and he suggested to the Committee that it would not be wise to depart from them. As to the establishment of a testing-place, he thought a district of 60,000 inhabitants might well ask for such a station.

Cross-examined by Mr. CRIPPS, witness said he had not based his evidence largely on the £61,000 spent in the last two years. What he said was that, having laid out this amount in two years, the Company had largely provided for the future, and therefore this affected the amount wanted.

Mr. CRIPPS: I understood you to say but for this large expenditure the amount we are asking could not be otherwise than reasonable.

Witness said he did not state that. He said that it would reduce from 25 to 20 years, the period over which the capital would carry the Company. He had not visited the works, and could not tell their present condition as regarded the further capital required. He could only speak from the growth of the concern and the extent to which the expenditure

made would go. He had, of course, come to the conclusion that the expenditure had been judicious.

Do you suggest that it has been beyond the requirements of the Company?—For two years, certainly.

How can you, without visiting the works, make an estimate of the value of the capital required for the future?—I can judge whether or not the works have been properly managed, and, from so much having been spent, assume that so much would require to be spent.

Mr. CRIPPS could not admit this argument.

In further cross-examination, witness said he did not suggest that the character of the gas would alter to any perceptible extent between the testing-place and Leyton; and he could not give any precedent where a gas company had provided more than one testing-station for the same works.

Re-examined: He had the authority of Mr. Thorman for saying that the works were sufficient for the next two years. He did not think the average expenditure of £10,000 a year for the last ten years would be exceeded in the future. He would suggest that the capital asked for should be reduced to £150,000 or £160,000 share capital, with a proportionate amount of loan capital, and that this would be sufficient to carry the Company over twelve years to come. This was a reasonable period within which companies should be allowed a free hand; and it ought not to be exceeded. A gas company ought to have storeage according to the maximum requirements of one day.

Mr. *Woodall* wished to explain, with regard to his evidence, that the Referees had power to order two testing-places, if they thought necessary, for one line of pipes.

Mr. PEMBROKE STEPHENS then addressed the Committee for the Leyton Local Board, and contended that the Bill was based upon the abnormal increase of the Company's district of supply; but common sense showed that this could not go on, and was only a passing result of exceptional circumstances, upon which had been founded extreme prospects and novel calculations which were opposed to all experience. Not only had the growth of population been abnormal, but the increase of the Company's expenditure had also been at the same exceptional rate. Taking their average from the expenditure of the last two years, it was one thing; but taking the average of the eight years preceding, it was only at the rate of £10,000 per annum, whilst in some years it sank as low as £4000, £6000, and £3000. Discussing in detail the financial scheme, he said it abounded with brilliant novelties and high-flown calculations. It was said by the adoption of this machinery the consumers would be obtaining a reduction in the price of gas; but they had had this under the old law, which they preferred. He admitted the plea of precedent; but along with precedent came the warning which was furnished them in the Ashton case. The Company first wanted to fix the present figure of 3s. as the standard on which they should pay the 10 per cent.; and then, if the price of gas was reduced, to further increase the dividend. This had operated prejudicially in the case of Ashton, and was opposed to the principle of the general law. The petitioners suggested that there should be a limit put on the amount the Company were entitled to carry over, and in regard to which the principle laid down by Parliament was that it should go in the reduction of the price of gas. The Bill contained a disguised method of defeating the intentions of the Legislature. It further sought to keep the Company away from the control of Parliament for a wholly unjustifiable period; and no harm would be done if this period were shortened. Under these circumstances, he hoped the Committee would refuse to pass the Bill in its present form.

Mr. BALFOUR BROWNE briefly summed up the whole case; repeating and emphasizing the arguments he had addressed to the Committee in opening.

The room was then cleared. On the parties being readmitted,

The CHAIRMAN said: With regard to the capital to be raised, the Committee are of opinion that the Bill should be altered to raise in ordinary shares £250,000, with borrowing powers of one-fourth, or £62,500. This would give £230,000 of ordinary shares under the old Act, and £250,000 under the present Bill—total, £480,000. Then you would have borrowing powers of £57,499 under the old Act, and of £62,500 under the Bill, which would give you £120,000 borrowing powers, or really £600,000 altogether. We think the new share capital should be raised at 7 per cent., and not at 10 per cent.; and I would just say, in passing, that I do not consider there is very much in the question either way. As regards the testing-place, we do not think it is required. As regards new roads, we are not prepared to make any special provisions. As to the amount to be carried forward from one half year to another, we are of opinion that it should not exceed a sum equal to ¼ per cent. dividend on the Company's paid-up shares for the time being.

Mr. BALFOUR BROWNE said, with reference to the latter point, that on the present capital of the Company this would amount to only £1150, whilst a reduction of 1d. per 1000 feet came to £2400. This was a very small sum.

The CHAIRMAN: Perhaps you had better put in £2000.

Mr. BALFOUR BROWNE submitted that this would still be a small sum for so large a concern.

The CHAIRMAN said the Company only carried over £1300 last year. The £2000 would be in comparison with the present paid-up capital, and, of course, as the capital was paid up would go on increasing at the percentage given.

The Committee then adjourned to enable clauses to be drawn up to carry out their decision.

FRIDAY, APRIL 5.

The adjustment of clauses was proceeded with to-day, when the decision pronounced by the Chairman the previous day was further modified.

Mr. BALFOUR BROWNE said he wished to address the Committee briefly with regard to their decision, limiting to £2000 the sum to be carried forward, and to ask them to reconsider this matter. What he desired to ask the Committee to do, was to give effect to what was asked for by the Leyton Local Board on Thursday. Mr. Pembroke Stephens then argued that, by the Bill and under the Ashton case, the fact was that all the provisions of section 35 of the Gas-Works Clauses Act, 1847, were done away with, and that this ought not to be allowed. Now, the promoters had considered the matter and the decision of the Committee; and they had come to the conclusion that it would be better for them, and better for the Leyton people also, to adopt the suggestion made, and apply the provisions of the Act of 1847 so far as was practicable. With this purpose he wished to submit the following clause for insertion:—"The Court of Quarter Sessions may, on the petition of any two gas consumers within the limits of supply of the Company, nominate and appoint some accountant, or other competent person not being a proprietor of any gas-works, to examine and ascertain, at the expense of the Company (the amount of such expense to be determined by the said Court), the actual profits of the Company for the preceding year, and to make report thereof to the said Court at the then present or some following session; and the said Court may examine any witnesses on oath touching the truth of the accounts of the Company and the matters therein referred to, and if it thereupon appear to the said Court that the profits of the Company for the preceding year have exceeded the amount necessary to pay the rate of dividend authorized by this Act, the Company shall make such a reduction in the price to be charged for gas supplied by them as in the judgment of the said Court shall be proper, but so that such price, when reduced, shall ensure to the Company a profit as near as may be to the rates authorized by this Act: Provided always that if in the case of any petition so presented, it appear to the said Court that there was no sufficient ground for presenting the same, the said Court may, if they think fit, order the petitioners to pay the whole or any part of the costs of or incident to such petition (the amount thereof to be determined by the said Court); and the costs so ordered to be paid shall be recoverable in the same way as damages are recoverable under this Act or the Acts incorporated therewith." If the Committee limited the Company's balance to £2000, the result would be this: At the present time, in order that they might reduce the price of gas 1d. per 1000 feet, they must have £2400 for the reduction and £600 for the ¼ per cent. dividend on the stock—that was to say, they must have £3000.

The CHAIRMAN: You are speaking of a year.

Mr. BALFOUR BROWNE said that was so; and he did not know what they should do at the end of the year with the £2000—it would be no use to them. But supposing the Committee fixed the limit at £3000, which would enable them to reduce the price of gas 1d. and pay the ¼ per cent., see what the result would be. It was true they would have sufficient money for these purposes, but they would leave themselves without a penny of balance to go on with. What his learned friend suggested was that, under the Act of 1847, it was not necessary to divide the profits until it was considered that the balance was larger than it ought to be, when an application to Quarter Sessions could be made, to compel them to reduce the price of gas. Having regard to the difficulties in the way of carrying out the decision of the Committee, they thought this would be the better course to pursue. He would call Mr. Woodall to explain.

Mr. CLIFFORD objected to his friend reopening the whole case. He asked that the decision of the Committee should be carried out, and said he did not think his learned friend had shown sufficient reasons for varying it. Assuming that £2000 was carried forward, the concern was a growing one, and the Company might look forward to what might happen in the succeeding year, when there would be a much larger amount than the £2000. This £2000, therefore, *plus* additions of profits, would amend the divisible sum; and therefore the difficulty that his friend suggested would not arise. They did not want to fetter the Company improperly and unduly; but it appeared to them that the decision of the Committee was a perfectly practical one. Clause 14 enacted: "If the clear profits of the undertaking of the Company in any year amounts to a larger sum than is sufficient to provide for the insurance fund and pay the dividends authorized by this Act on the ordinary shares or stock of the Company, or the dividends on the preference capital (if any), the excess shall be carried to the credit of the divisible profits of such undertaking for the next following year;" and they suggested the following proviso:—"Provided the excess so carried over shall not at any time exceed the sum of £2000."

Mr. BALFOUR BROWNE said the action of his learned friend was very ungracious.

The CHAIRMAN thought Mr. Browne was rather confusing the half year and the year. The judgment of the Committee was that at the end of the half year the amount of balance should not exceed £2000. He did not think Mr. Browne was quite correct in his general premises, because when the Company carried forward a large sum they had arrived previously at the amount they were going to declare as a dividend, and the sum, consequently, that would fall to the consumers of gas. The Committee thought this would have given the Company a pretty good turnover, even if the capital increased to £480,000, in granting the £2000. Under all the circumstances of the case, the Committee would increase the sum to £2500 in any half year; and he was sure this would give the Company plenty of scope, and the Committee did not think they need trouble the Quarter Sessions.

Mr. BALFOUR BROWNE: You said that the £4000 was with regard to the present capital.

The CHAIRMAN: I think it ought to cover everything.

Mr. BALFOUR BROWNE said that was rather cutting the Company down, because they would have had £4000 when the whole amount was raised.

The CHAIRMAN thought the Company would do very well with the terms granted. He suggested the following proviso to clause 14:—"Provided that such excess in no half year shall exceed the sum of £2500."

After some further discussion, the clause was agreed to as follows:—"If the clear profits of the undertaking of the Company in any year amount to a larger sum than is sufficient to provide for the insurance fund and pay the dividends authorized by this Act on the ordinary shares or stock of the Company, or the dividends on the preference capital (if any), the excess shall be carried to the credit of the divisible profits of such undertaking for the next following year: Provided that such excess in no half year shall exceed the sum of £2500."

The remaining clauses were then adjusted to give effect to the decision of the Committee, and the clauses conceded to the West Ham Corporation were interpolated. They provided for a testing-station within the borough, and the mode and time of testing. As to purity, the section enacted that the gas should be free from sulphuretted hydrogen, and should not contain more than 4 grains of ammonia or more than 25 grains of sulphur in 100 cubic feet. A further clause provided for the charging by meter for gas supplied for the purpose of public lighting.

The Bill, as amended, was ordered to be reported to the House.

THE MANCHESTER CORPORATION WATER BILL.—The Bill promoted by the Corporation of Manchester was before the Chairman of Committees of the House of Lords (Lord Morley) yesterday week as an unopposed measure. The principal matters of interest in the Bill are the provisions relating to the alterations of the water-works at Thirlmere. It was proposed by the Act of 1879 to raise the lake 50 feet, and to provide a daily supply of 50 million gallons of water. Since then the Corporation have resolved to reduce the scale of the works; the present proposal being to raise the level of the lake only 20 feet, and to provide a supply of 10 million gallons per day. The Bill also sought to obtain manorial rights over the property owned by the Corporation in the neighbourhood of the lake. The Corporation agreed, in accordance with the views of certain residents, to make a road 16 feet wide along the west shore of the lake. In reference to the opposition of the Local Government Board, who had reported adversely thereon, the proposal to acquire manorial rights was struck out of the Bill; so that there was no opposition from any quarter. Sir J. J. Harwood, the Deputy Town Clerk (Mr. Talbot), the Engineer (Mr. Hill), and the Parliamentary Agent attended before the Committee. It was stated in answer to the Chairman, that the clauses had been fully discussed with the parties interested; and so far as was known they were satisfactory. It was ordered that the Bill should be reported for third reading.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

WEDNESDAY, MARCH 27.

(*Before Mr. Baron* HUDDLESTON *and a Special Jury.*)

UNGAR *v.* SUGG AND CO.

This case was briefly reported in the JOURNAL last week. The plaintiff sought to restrain the defendants from representing that his lamps were infringements of the patent alleged to belong to them; from threatening his customers if they dealt in or used the plaintiff's lamps; and from publishing any defamatory statement in regard to his lamps. He also asked for a declaration that he had not infringed the letters patent of the defendants, or if any part of the lamps made by him were protected by those letters patent, then that it might be declared that such letters patent were invalid.

Mr. KEMP, Q.C., Mr. E. MORTON DANIEL, and Mr. WILKINSON appeared for the plaintiff; Mr. ASTON, Q.C., Mr. MOULTON, Q.C., and Mr. CHADWYCK HEALEY for the defendants.

Mr. ASTON, having successfully raised a preliminary point that, as the validity of the defendants' patent was in question, he was entitled to open the case, said that Mr. Sugg, one of the defendants, had devoted a great deal of time to the improvement of gas lighting, especially since the introduction of electric lighting in the years 1878 and 1879. The improved lighting in Parliament Street was due to a new principle introduced by Mr. Sugg in the construction of gas lamps. He took a lamp of the ordinary form, but instead of allowing the air to enter where the light was, the principle adopted was a closed lamp. The invention consisted of making at the top of the lamp inlet passages which were practically separated from the outlet passages or chimney. The air was admitted at the top, and thrown down by the cone deflector, upon which the currents of air impinged, to the sides. It then reached the flame in a heated and rarefied condition, which gave a brilliant light, while the vitiated air escaped by the outlet passages. Mr. Sugg found that Mr. Ungar, the plaintiff, had been supplying lamps which were made in exact imitation of his own; and he informed Mr. Edwards, to whom the lamps had been supplied, that they were an infringement of his patent, and he would be compelled to give up using them or pay a royalty. The plaintiff had been informed that, if he agreed to pay a royalty, his trade would not be interfered with. He contended that the first question for the jury would be whether the invention was new and useful, and properly described in the specification, and whether the patent was a valid one; secondly, was the lamp made and sold by Mr. Ungar, and used by Mr. Edwards, in substance the same as Mr. Sugg's patent lamp? If they answered this question in the affirmative, defendants were justified in making the threats. The substantial point was this: Was this a new and useful invention, and had Mr. Ungar infringed the patent rights of Mr. Sugg.

THURSDAY, MARCH 28.

On the resumption of the hearing of the case to-day,

Dr. *John Hopkinson* was called by Mr. ASTON, and said that he had given his attention to gas lighting, and to the construction and ventilation of lanterns, for about 17 years; and was acquainted with the specification of Mr. Sugg's patent of Dec. 24, 1879—the one in question. In the upper portion of the lamp there described, there was an inlet and outlet for air. The incoming current came in about half way up the total height of the lamp, then passed round the upper edge of the truncated cone, and was deflected outwards. The air became heated, and supplied the flame with warm instead of cold air for combustion, by which means a better light was given. The air was then carried up through the funnel against what was called the "conical annulus," which deflected the current of air and sent it into the outer air. He had read Mr. Bray's specification; and it did not describe a lamp like Mr. Sugg's. All the modifications in Mr. Sugg's specification were sufficiently described, and were useful and novel at the date of the patent. He had inspected a lamp at Mr. Edwards's place of business in High Street, Clapham. The one he examined was constructed on the same principle, and attained the same end, as Mr. Sugg's, by substantially the same means. There was a difference in form, but not in substance, between the functions of the annular channel of Mr. Edwards's lamp and the annular channel of Mr. Sugg's; but there was no difference in the effects. The position of the gas-flame in the body of the lamp was the same as shown in the specification—viz., high in the lamp. The incoming currents of air were deflected, and went below the burners, and were supplied to the flame in a rarefied and heated condition. The vitiated air and products of combustion passed upwards from the flame, impinged upon the under surface of the cone, and passed out at the top of the lamp.

In cross-examination, witness said the complete separation of the incoming from the outgoing air, and the deflecting of that air on a cone, were new in Mr. Sugg's patent. Heated air produced a substantially better flame than cold air. As to the cones or surfaces, in Mr. Sugg's lamp there were three, and only two in Mr. Ungar's. In Mr. Sugg's patent there was what was called a "baffle," which did not exist in Mr. Ungar's lamp. The air passed down, striking upon the cone, and moving over to the side in Mr. Sugg's patent. In Mr. Ungar's patent, practically none of the air went up in the lamp he had examined, but was deflected on to the sides to a considerable extent. It was his opinion that when the air passed round the edge of the cone in Mr. Ungar's patent, it would not make for the burner at once, but the momentum would carry it a great way down the lamp. One of the objects of the momentum was to carry it down the sides, and below the flame. The momentum in Mr. Sugg's lamp was greater than in Mr. Ungar's. It was not his idea that the width of annular space would infringe Mr. Sugg's patent. The chimney openings were similar to Mr. Sugg's. According to one of Mr. Bray's specifications, it appeared that he intended the air to enter at the top. In Mr. Bray's lamp the air was not deflected on to the sides.

In re-examination, witness stated that he had experimented with one of Mr. Bray's lamps. The flame burnt all right for a time; but after a while it became dim, because there was no circulation of air. A lamp so constructed would not work like one made according to Mr. Sugg's patent, because the cone was too small, and there was no proper separation between incoming and outgoing air. The prime purpose of Mr. Bray's specification was to admit all the air at the bottom, which constituted a material difference between the two patents. There was no substantial difference between the surfaces of the Edwards and the Sugg lamps. In the Ungar-Edwards lamp that he inspected, the means of rarefying the air on its admission, and deflecting it on to the sides of the lamp, were substantially the same as in Mr. Sugg's. There was a momentum given by the same means in Mr. Edwards's lamp as in Mr. Sugg's, to deflect the air towards the sides. The openings in the chimney were practically the same, although there was a little variation in form.

Sir *F. Bramwell* said that he had devoted considerable attention to the construction of lamps, and had read Mr. Bray's specification. He had heard the evidence of Dr. Hopkinson as to the similarity and dissimilarity between Mr. Bray's and Mr. Sugg's lamps, and entirely agreed with it There was no substantial resemblance between the lamps.

In cross-examination, he said that the Bray lamp differed both from the Sugg and the Ungar-Edwards lamp. There was a modification of the Bray lamp where the air entered at the top; but this was not similar to the Ungar-Edwards lamp. There was no separation of the incoming and outgoing air in the Bray lamp, while there was in the Ungar-Edwards lamp. In Mr. Bray's lamp there was not any efficient cone to rarefy the air or deflect it to the sides of the lamp; but according to Mr. Sugg's patent the air entered entirely from the top of the lamp. He was not aware that in the Ungar-Edwards lamp the glasses were loose, so that the air could get through them. If there were interstices, the air would find its way in. What he meant by the separation of air was that air coming in at the top was substantially separated from the air going out at the top. In the Ungar-Edwards lamp there was, for all practical purposes, a complete separation. He knew that in Mr. Sugg's patent the air passed into the annular passage and downwards in the first instance; but he was not aware that in the Ungar-Edwards lamp part of the cold air went downwards and part upwards. Taking the lamp from the drawing, this could not be the fact.

In re-examination, witness in substance said the Ungar lamp was the same as Mr. Sugg's.

Mr. *W. W. Ives* said he was a mechanical engineer in the employ of the defendant Company, and was acquainted with the construction of gas-lamps. On the 21st of April, 1887, he was sent by Mr. Sugg to take a copy of an Ungar lamp at Mr. Edwards's shop in Clapham. He saw four lamps, he believed, and examined and measured one. He had been to Mr. Edwards's shop that morning to examine the lamps. He found there were nine, and the top part of the cones were level with the horizontal plates as perforated to allow fresh air to enter the lamp. Between the horizontal plate and the cone reflector, there was a gap about $\frac{1}{4}$ inch large. This did not exist in the lamp of which he took a sketch in April, 1887. When he examined the lamp, he did not have it taken down; but he went sufficiently close to it to examine it thoroughly. He felt to see whether there was a communication between the inlet air passages and the chimney, and found there was not. One of his objects was to ascertain whether there was any communication between the two passages, and he tried it with a pen-knife, and did not find even a crack there.

Mr. *E. Talbot*, a draughtsman practising under Dr. Hopkinson, said he had had considerable experience with lamp drawings. He had been that morning to look at Mr. Edwards's lamps with Mr. Ives, and personally examined them; and they all appeared to be the same. There was a passage between the horizontal plate and the top part of the cone, about $\frac{1}{4}$ inch large, all round.

Mr. *W. T. Sugg* said he was the patentee and assignor of the defendants in respect of the patent of December, 1879, the subject of the present inquiry; and was, according to his belief, the true and first inventor of the arrangement patented. He believed the invention to be a new and useful one at the date of the patent. He remembered having his attention directed to certain lamps alleged to be used in Mr. Edwards's shop in 1887; and he went to see them about March or April of that year. There were seven lamps fixed up when he went; and he made an examination of all of them from the pavement. As far as he could see, they were made exactly in accordance with his patent, and the glass part was closed. The burners were in a similar position to the burner in his lamp; and the air inlet passages were the same. The lamps were burning when he saw them; and he was able to form a conclusion, from the appearance of the gas, as to what was the construction of the lamp. The burners were a close imitation of his own; and the appearance of the flames was bright. Looking up from the reflector, it appeared that the air coming in was warmed and deflected on to the glass, as shown in his patent. The whole lamp, with the exception of the top, appeared to be a copy of lamps he made especially for drapers. He thought there was a slight gap between the air passages and the chimney—not more than $\frac{1}{8}$ or $\frac{1}{4}$ of an inch at the outside; and in some they appeared to fit quite tightly into the place which the reflector was intended to fit in. He carefully examined all the lamps; not to ascertain whether there was a separation, because it never occurred to him that there was one. It was only since he had been told that there was a separation that he had looked for it. The cone was intended to fit inside the plate, and separate the incoming from the outgoing air. Subsequently he sent Mr. Ives to make measurements of the lamps. After examining them, he went to Mr. Edwards and told him he had some lamps without a name upon them; and as they appeared to be exact copies of his (Mr. Sugg's) lamps, he must ask him to take them down or pay a royalty for using them. Mr. Edwards said he was not aware of this; and he (Mr. Sugg) sent Mr. Edwards his specification, in order that he might see what the patent was. Mr. Ives showed him the drawing and the measurements he had made; and the former appeared to be the same as the lamp he had noticed. Subsequently to the spring of 1887, he visited the same place with Dr. Hopkinson, with whose evidence he agreed, as well as with that given by Mr. Ives as to the condition of the lamps.

In cross-examination, witness said the gap he saw was scarcely perceptible—only the point of a knife could be put in it. He had been to Mr. Edwards, and warned him about using Mr. Ungar's lamps, which he understood were supplied to Mr. Edwards through Drew. After a considerable time, the name of "Drew, agent for Ungar and Co.," was put on the lamps; but the name was not there when he examined the lamp.

Mr. KEMP, in opening the case for the plaintiff, said that if Mr. Sugg had a just claim against Mr. Ungar for infringing his rights, why did he not proceed against him, and obtain an injunction? Instead of doing this, he went to Mr. Ungar's customers and used threats which must end sooner or later in Mr. Ungar's ruin; at any rate, he was obliged to prepare for an expensive litigation for the purpose of putting a stop to it. It had been admitted by Sir Frederick Bramwell and Dr. Hopkinson that if the lamp which the plaintiff asserted was the one he put up for Mr. Edwards was in reality the lamp in Court, it was not an infringement of the defendants' patent. If the air went in as described by Sir Frederick Bramwell, it was admitted that that lamp was no infringement. The great principle operating in Mr. Sugg's lamps was not to be found in Mr. Ungar's. The point of Mr. Sugg's patent was that there was a substantial division between the incoming and outgoing air; but in the lamp put up at Mr. Edwards's there was no such division —the two currents mixed together. Therefore it was quite clear there was not an infringement of the patent. Counsel for the defendants had been relying upon the theory that a fraudulent lamp, not the lamp originally supplied to Mr. Edwards, had been put forward; but abundant evidence would be called to show that this was not so.

FRIDAY, MARCH 29.

Sir *F. Bramwell* was recalled, and, in answer to his LORDSHIP, said that the Ungar-Edwards lamp was not in its present condition the same in principle as Mr. Sugg's lamp.

In reply to Mr. ASTON, witness said that in the Ungar-Edwards lamp

the neck of the cone was so far below the bottom of the chimney as to leave a belt opening, which, according to his measurement, was four times the area. There was no separation between the incoming and outgoing currents of air.

Mr. KEMP said he had directed his attention to this point with regard to the nine lamps which were Mr. Edwards's; and they were not an infringement of Mr. Sugg's lamps in principle—viz., a separation of the incoming and outgoing air.

His LORDSHIP asked where, in the specification of the defendants, was stated the principle of the separation of incoming from outgoing air.

Mr. ASTON replied that it was not so stated. He also said the principle of construction in the drawing was the separation, and the principle of action were utilizing incoming currents, heated, deflected, and supplied in a heated state.

His LORDSHIP said he understood the patent to be for the separation of the incoming and outgoing currents, which were deflected down the side of the lamp, and then carried up so as to let the vitiated air off at the top.

Mr. ASTON said that the two operations were the same.

Mr. KEMP said the matter had resolved itself into a question of fraud, as to whether they had brought a lamp which was not really the lamp in question. He was content to take this proposition; but he was prepared to contend that the lamp was not Mr. Sugg's patent at all, and that the principle of the specification was entirely different from it.

Mr. *Edwards*, examined by Mr. KEMP, said he was the proprietor of the shop where nine of Ungar's lamps were erected. Mr. Stephens was his architect; and he had left the selection of lamps to him. Mr. Ungar had written for one lamp to be taken away in March of this year, and another was put in its place. With this exception, none of the lamps had been altered or tampered with. Mr. Sugg called upon him some little time after the lamps were erected—about March or April, 1887—and said that he had erected some lamps which were an infringement of his patent, and that he should expect him to pay a royalty.

His LORDSHIP said the real question was whether there had been an invasion of Mr. Sugg's patent.

In cross-examination, witness said that the lamps were put up about the spring of 1887. The cones were taken out for the purpose of cleaning; but not one of them was ever repaired by Mr. Ungar's men.

Mr. *J. W. Stephens*, an architect and surveyor, said that in the spring of 1887, when he was employed about some alterations to Mr. Edwards's premises at Clapham, his advice was asked as to the lamps to be placed outside the shop. He accordingly visited and inspected the lamps in use at different establishments, amongst them being lamps made by Mr. Sugg. After comparing Mr. Ungar's and Mr. Sugg's lamps he selected Ungar's, because he thought that by the diffusion of air in the lamp it would not become hot, that there would be less breakage of glass, that it could be more easily cleaned, and, there being no double roof, that the annular space between the double roof would not get choked up with dirt. He had noticed in Mr. Ungar's lamp the point where the air entered, and also a provision whereby a portion of the air entering the lamp was led, not to the flame, but directly to the chimney—in fact, there was no separation between the incoming and the outgoing air. The air allowed to go up the chimney was restricted to a narrow space; but there was no complete separation. The nine lamps were put up under his supervision. He inspected them; and they were alike in every respect. According to his observation, the drawing made by Mr. Ives was not correct. He had had one of the lamps tested with smoke, and found that there was no separation between the incoming and outgoing current of air.

In cross-examination, witness said he was not a lamp maker, and had no particular experience in the manufacture of lamps; but he thought the invisible streams of air from the loose bottom of the glass sides supplied the burner. The Ungar lamp was cheaper than the Sugg lamp.

Mr. *W. Salter*, a gas-fitter, said that part of his business was to supply lamps to shops. It was through him that a Mr. Proctor obtained his lamps; and he had received a threat of proceedings from the defendants' solicitors.

Mr. *W. Busk* said he had been in the service of Mr. Ungar for 21 years. He had taken part in the construction of the nine lamps put up at Mr. Edwards's, and had examined them about three weeks previously. From the time of putting them up until then, they had not been altered. In the nine lamps there was no separation between the incoming and outgoing air.

Mr. *J. Ungar* said he was the plaintiff. Since 1860 he had been a maker of lamps, and had brought out numerous kinds. Before 1879 lamps were used with conical roofs; and his lamps were made from the same pattern. He had three holes pierced sufficiently large to admit the air, for the purpose of causing the upper draught to be equalized, if there should be a variation. There was no complete separation between the incoming and the outgoing air.

In cross-examination, witness said that if the cones dropped, the aperture would be larger. In his lamp part of the incoming air went to the chimney, and part into the body of the lamp.

This concluded the evidence.

After the address of Counsel to the jury,

His LORDSHIP summed up. He said the real question the jury had to decide was whether the patent had been invaded. The action was brought under the provisions of the Patent, Designs, and Trade Marks Act, 1883, which enabled a person threatened by an alleged patentee to bring an action against the person who made the threats. Then the alleged patentee would have a right to set up in his defence that the threats were well founded, because his patent had been invaded. The facts of the case were that Mr. Sugg went to Mr. Edwards, and complained to him that the lamps supplied by Mr. Ungar were infringements of his patent, and he intimated to Mr. Edwards that he must either pay a royalty or discontinue the use of the lamps. Upon this Mr. Ungar brought his action. It therefore became a question whether Mr. Ungar had invaded Mr. Sugg's patent. In an action of this kind, the burden of proof was on the person who complained of the threats, to show that the person claiming the patent had no right to it. If the jury thought that Mr. Sugg's patent had been invaded by Mr. Ungar, or that Mr. Ungar had not made out that Mr. Sugg's patent was wrong, then their verdict would be for Mr. Sugg; but if they thought that Mr. Ungar had not invaded the patent, their verdict ought to be for the plaintiff. The question of damages had been agreed to be referred, if necessary. The question was not whether it was a casual imitation, but whether the substance of the invention had been taken. Mr. Sugg's invention seemed to be the letting in to the lamp of cold air, which came round over a deflector which was heated by the lamp. The air was heated, went down the side of the lamp, turned up to the flame, and furnished it with heated air. Mr. Sugg considered this a very important thing, because gas burnt in heated air gave a more brilliant light than with cold air. When the air so introduced, heated and deflected, became vitiated, he provided for carrying it up the chimney. Although he did not mention it in his specification, he attributed considerable importance to the separation of the incoming and outgoing air. The deflection of the air on to the sides of the lamp ensured perfect ventilation; all the currents tending towards the centre, and finding their exit by the chimney. Mr. Sugg's notion was that the great benefit of his invention was that the flame should be fed with heated air. Mr. Ungar took a different view. He did not believe in heated air. He made a lamp into which air was admitted; but he said he did not want it for the purpose of combustion. A great deal of it went up the chimney, and a portion came down and fed the burner. The glass in his lamp was unputtied; and through the opening the cold air passed to the light and was consumed. These were the two views; and the jury had to consider whether Mr. Ungar in carrying out his ideas had not so modified them as to take the substance of Mr. Sugg's patent, and, that while deprecating the use of hot air, had really taken means by which he obtained it. He (his Lordship) had a profound respect for scientific witnesses; but he refused to be bound by their evidence, unless it carried conviction to his mind, because they gave their views not as impartial, but as trained witnesses. Then some doubt had been thrown upon certain of the examples put before them. The jury would ask themselves this question: Had Mr. Ungar taken the substance of Mr. Sugg's patent. If he had, their verdict would be for the defendants. It lay on Mr. Ungar to show that Mr. Sugg's lamp had not been invaded in any way. If, on the other hand, they should think that Mr. Sugg's patent had been invaded by Mr. Ungar, they ought to find their verdict for the defendants. If they thought that Mr. Sugg's patent had not been invaded by Mr. Ungar, and that Mr. Sugg had made threats which he could not support, then the plaintiff would be entitled to their verdict.

The jury, after a short consultation in private, returned a verdict for the plaintiff.

His LORDSHIP granted an injunction, and ordered an inquiry as to damages. He also directed that the defendants were to have the costs of the issue as to the validity of the patent.

MARYLEBONE POLICE COURT.—WEDNESDAY, APRIL 3.

(*Before Mr.* A. DE RUTZEN.)

LONDON COUNTY COUNCIL *v.* THE GASLIGHT AND COKE COMPANY.

CONVICTION FOR DEFICIENT ILLUMINATING POWER OF GAS.

To-day two summonses, issued on the complaint of the Metropolitan Board of Works (whose successors, under the Local Government Act, are the London County Council), to recover forfeitures incurred by the defendants for supplying gas of alleged deficient illuminating power at the testing-place in Grove Gardens on Oct. 11 and Nov. 5 last, were before the Court. The facts of the case are in almost all respects similar to those of the action reported at length in last week's JOURNAL.

Mr. ROBERTS appeared for the London County Council; Mr. BESLEY (instructed by Messrs. Bedford, Monier-Williams, and Robinson, of 6 & 7, Great Tower Street, E.C.) for the Company.

Mr. ROBERTS, in opening the case, said that the Acts referred to in the summonses were The Gaslight and Coke Company's Act of 1876, and The Gaslight and Coke and other Gas Companies' Act of 1860. He then read the various sections of those Acts upon which he relied; and, in referring to the 40th section of the 1860 Act, said it would be seen that if there was only ½ candle deficiency in illuminating power the penalty was 40s., which was the penalty in each of the present cases.

Mr. BESLEY observed that the interpretation put upon this section by the Company was that until ½ candle of deficiency was exceeded there was no penalty.

Mr. ROBERTS remarked that it would save time perhaps if he pointed out that the deficiency in one case was 0·5 candle, and in the other 0·6 candle. He contended that if a deficiency of ½ candle was shown, then the penalty was incurred. He placed special stress on the section of the Act which states that the report of the Chief Gas Examiner on appeal shall be "conclusive evidence" of the Company's liability to a forfeiture; but admitted, as his learned friend would no doubt contend, that in this case his Worship had power, under the Summary Jurisdiction Act, to mitigate the amount of the penalty, which, he incidentally remarked, would not go to the controlling authority, but to the Receiver-General of Police. His Worship had, according to his (Mr. Roberts's) reading of the Act, no power to go into the merits of the case. This would require a scientific investigation, which had already taken place. The Company, being dissatisfied with the Gas Examiner's return, appealed to the Chief Gas Examiner (Professor Williamson); and he held an inquiry. The case on behalf of the Company was then conducted by the gentleman who instructed the learned Counsel that day (Mr. Monier-Williams); and the Metropolitan Board of Works were represented by their Superintending Gas Examiner (Mr. W. J. Dibdin). The result of the appeal was embodied in the Chief Gas Examiner's report, which had reference to three returns of deficient illuminating power—at the Grove Gardens station on Oct. 17 and Nov. 5, and at the Hornsey Road testing-place on Oct. 18. [Mr. Roberts then read the document, which was included in our report last week of the Hornsey Road case heard at the Clerkenwell Police Court. It showed that the illuminating power of the gas at the Grove Gardens testing-station on the two days named was 15·5 and 15·4 candles respectively, and that the Chief Gas Examiner was satisfied that the tests against which the appeals were made, were duly carried out by the Gas Examiner in accordance with the provisions of the Special Act and the Instructions of the Gas Referees.] It would be noticed (proceeded Mr. Roberts) that the Special Act said that the gas should be equal to a light produced by 16 candles. Therefore if the illuminating power was less than 16 candles, it was contrary to the Act, although it might not be that there was any forfeiture incurred. It had been suggested that this was a frivolous prosecution, simply because the deficiency was small; but he submitted that there was nothing frivolous about it. The Act said that the standard "shall" be 16 candles. Certainly there was no forfeiture until there was a deficiency of ½ candle; but, if there was any defect, then he took it that an offence had been committed against the Act. He only proposed to call the gentleman who had made the tests and gave the returns which were appealed against.

Mr. *B. F. Halford*, B. Sc., deposed to being appointed a Gas Examiner by the Metropolitan Board in June, 1883; and said he had continued to act in that capacity since then. His regular station was at Grove Gardens. On Oct. 17 he made the usual tests; and the average was 15·5 candles. The amount of deficiency was fully ½ candle. With regard to the tests for Nov. 5, the average was 15·4 candles, which was a deficiency of 0·1 more than the ½ candle. He gave evidence on the occasion of the appeal before the Chief Gas Examiner.

In cross-examination, witness said he did not believe he made more than three tests on Oct. 17. The uncorrected readings were 14·6, 15·59, and 15·49 candles; and he corrected them in bulk.

Mr. BESLEY: I suppose you do not deny that it is impossible that the 14·6 could be a correct reading.

Mr. ROBERTS: He says they are uncorrected readings.

What time do you record the beginning of your test.—I record the first test at six o'clock in the evening.

You make the record for every minute for ten minutes do you?—Yes.

Do you allow an hour to elapse after the observation of the last testing?—I allowed a full hour from the first observation.

Do you read your instructions to mean that you were to take out of the hour the nine minutes?—I had no instructions except as to the Act.

You regard the hour to elapse between the two testings as being exactly 51 minutes, and not 60 minutes?—It does not, I fancy, say between the two testings in the Act.

What do you mean by saying the Act does not provide for an hour between the ending of one testing and the beginning of another? The 7th section of the Act of 1880 says: "The tests for illuminating power shall be taken at intervals of not less than one hour." It provides that you shall leave 60 minutes between the end of one test and the beginning of another.—It does not say so. It says: Provided that the tests for illuminating power shall be taken at intervals of not less than one hour.

So you take off the nine minutes that was due?—Yes.

Did you begin your test by recording the height of the flame at 2½ inches?—No; I do not think I did. I noticed the height of the flame before I started my test.

Mr. DE RUTZEN observed that he had no doubt Mr. Besley had an object in view; but it appeared to him that he was asking him to test the accuracy of the Chief Gas Examiner's decision.

Mr. BESLEY said it was not exactly that. Of course, he should take his Worship's ruling; but he submitted very confidently that there had been no proper hearing of the parties at the appeal. He should show that, when the Chief Examiner was asked to allow evidence to be given to show that on this day official testings at other places conclusively led to the fact that this gentleman was wrong in his figures, he refused to have it laid before him. That was not a proper hearing of the appeal; and consequently his Worship was not in a position to put any forfeiture at all upon the Company. If he was against him on that point—if he did not intend to allow him to show that there had been no proper hearing of the appeal—it would be a pure question of law.

Mr. DE RUTZEN said he really did not think he ought to hear any evidence as to the testing.

Mr. BESLEY said it was not a favourable time for discussing the grievance of the Gas Companies, because the powers of the Metropolitan Board had gone into the hands of the London County Council. But the Gas Companies would, of course, endeavour to bring about what was admitted now by all scientific men, including Mr. Dibdin—viz., that the burning of the standard candle was subject to such variations and inaccuracies that it was a most unsatisfactory mode of measuring the illuminating power of the gas. If his Worship could have had the real merits of this matter before him, he would have seen how this was; but if he could not hear the whole matter, he (Mr. Besley) would refrain from asking any further questions of the Gas Examiner, and would merely deal with such general topics as would induce him to impose a nominal penalty. He had to suggest that this was a most improvident prosecution, considering the small amount of variation, even if the gas was tested in an absolutely accurate manner.

Mr. ROBERTS said he should like to say, in fairness to the late Board, that they had no more control over the standard of light than the Company had. It would be to the advantage of the Company, who were the proper persons, to move the Legislature with a view of bringing about an amendment of the law.

Mr. BESLEY observed that there was no obligation upon the Board to take out summonses when, by comparison with the official tests in the City of the same gas on the same day, they would find they had gas of full illuminating value. Without going into the merits of the case, he had to ask his Worship whether any fine should be imposed. This was not, he thought, the proper time to go into technical questions of law, as the London County Council would probably consider the whole subject of their arrangements with the Gas Companies; but, turning to the general question, it did seem an extraordinary thing that the official testings at five different places on the same day were above 16 candles. At Dorset Street, on Oct. 17, the return was 16·6 candles; and at Kinghorn Street, 16·7. On Nov. 5 it was 16·5 and 16·7 candles respectively. At Spring Gardens they reported the gas at 16·1 candles. These were very strong facts; and they showed that there was either a slight imperfection in the manner of making the tests, or some contamination, to account for the deficiency. Although the Company were not relieved by the Chief Gas Examiner of the liability to a penalty due to an unavoidable accident, still it was entirely for his Worship to consider whether this was a wilful breaking of the law, or such a breaking of the law as deserved a fine which would show that his mind was bent on the view that the Company were avoiding their responsibility. Since the tests in question were made, one of the Company's men had been present when the Examiner was testing the gas; and there had not been any deficiency. This was a trumpery and frivolous case; and he was afraid it was brought because the Metropolitan Board were on their last legs.

Mr. DE RUTZEN: It is a small question; and it lies in a nutshell. There is nothing important in it.

Mr. BESLEY: Except, perhaps, that public bodies are apt to attach importance to these things.

Mr. *G. C. Treweby*, in reply to Mr. BESLEY, said he was Chief Engineer of The Gaslight and Coke Company. The make of gas at the Beckton works per 24 hours was from 40 to 45 million cubic feet; and the average daily delivery from the whole of the works was 80 million cubic feet. There was no reason for complaining of the deficiency of illuminating power. The same gas at other stations was returned on the days in question at above 16 candles. The candle, he agreed, was a very unreliable standard. The Board of Trade had had this matter of testing under their consideration, and were now about to appoint a body of scientific men, independent of the Gas Referees, to arrive at a standard of light. Since the Company had given instructions for one of their men to be present during the testing of the gas, there had not been a single complaint of low illuminating power.

Cross-examined: They put a man on at the Grove Gardens testing-station on March 2. He admitted that the gas had since then been returned at 15·8 candles twice; but he did not regard those as complaints. It was true that it had always been open for the Company to have a man present during the testing of the gas. But they did not want to dispute the accuracy of the tester; and therefore they did not think it right to go and put somebody opposite him while making his observations. They could not, previous to March 2, understand the returns sent in; and as soon as they put on a man the results went up—the next day, to 16·3 candles. On three successive days preceding March 2, they had returns of 15·4, 15, and 15·2 candles. On the two occasions since March 2 when the gas was returned at 15·8 candles, the testing at Dorset Buildings was 16·8 and 16·6 respectively; Kinghorn Street, 16·7 on both days; and Spring Gardens, 16·6 and 15·7. The Company's own tests at Dorset Buildings practically corresponded with the official returns. The holders which supplied the main leading to Grove Gardens were kept exclusively for the gas manufactured at Beckton.

Re-examined: With regard to the three successive low readings at Grove Gardens prior to March 2, the returns from the other stations did not corroborate them.

Mr. DE RUTZEN observed that he was not then going to decide the case, as he desired to inform himself a little more as to what were his powers under the Summary Jurisdiction Act. If he thought, on the evidence, that he could treat it in this way, he would see what were the powers that enabled him to do so.

TUESDAY, APRIL 9.

Mr. DE RUTZEN, in delivering judgment to-day, said that practically this was an independent case; and his only reason for adjourning the matter was to see whether he could fall in with the suggestion made by Mr. Besley that he should dismiss the summons without proceeding with a conviction. He had carefully considered the matter; and it appeared to him that he should be doing wrong if he did so, because, as a matter of fact, the Legislature in this particular instance defined exactly what the offence was to be. If he were to dismiss the summons on the ground that it was trifling, it would be trifling with the Act. It was a matter on which he could not go behind the report made by the Chief Gas Examiner. It might be that, if he had to decide the matter, there was much which showed that there was great difficulty in determining whether the standard was correct or not; but he could not go behind the report. There would be a small fine of 20s. in each case, and 2s. costs.

SALES OF SHARES.—Thirty-five new shares of £20 each in the *Colchester Gas Company* were recently sold by auction at £31 each; and six similar shares realized £31 10s.——At West Hartlepool last Thursday, 250 fully-paid up shares of £10 each in the *Hartlepool Gas and Water Company* sold at prices ranging between £15 7s. 6d. and £15 11s.

NEW JOINT-STOCK COMPANIES.—The following new joint-stock undertakings have been registered:—The Fenby Oil Lighting and Heating Syndicate, Limited, with a capital of £40,000, in £1 shares, to acquire from Mr. J. B. Fenby his inventions relating to improvements in the supply of hydrocarbon oils to burners for lighting and heating purposes, and to carry on the business of manufacturers and dealers in material necessary for utilizing these inventions. The Northampton Electric Light and Power Company, Limited, with a capital of £20,000, in shares of £1 each, with the object of carrying on a general electric motor and lighting business. The Water Softening Company, Limited, with a capital of £20,000, in £10 shares.

SALE OF THE CHARD GAS-WORKS.—The shareholders of the Chard Gas Company have unanimously agreed to accept the terms offered by Messrs Willey and Stone for the purchase of their property. Considerable enlargement of the works will be necessary, as the purchasers have acquired from the town their interest in the gas supply to the premises of Messrs. Boden and Co.; and the extensions are now being carried out. The interests of the consumers are duly protected by an agreement that the existing price of gas—viz., 4s. 2d. per 1000 cubic feet—shall not be exceeded; and that the public lamps are to be supplied at the rate now charged—£2 17s. 4d. each. Mr. Willey is a member of the well-known firm of gas engineers, of Exeter; and his partner, Mr. Stone, was formerly Engineer of the Weymouth Gas Company.

EXHIBITIONS OF GAS APPLIANCES.—A highly successful exhibition of gas appliances for lighting, heating, and cooking, was held at Lowestoft, under the auspices of the Gas Company, from the 9th to the 12th inst. The heating and cooking appliances were supplied by Messrs. Thomas Fletcher and Co., and an assortment of improved lamps, burners, and fittings was exhibited by Messrs. W. Sugg and Co., Limited, and Messrs. H. Greene and Sons, of London. Free cookery lectures, with demonstrations, were given twice daily by Miss E. J. Cameron, to large audiences. A largely attended exhibition of gas appliances has just been held at the West Kensington Hall, Hammersmith Road, W., where a large collection of gas cookers, fires, and coffee-roasters, &c., was shown by Messrs. T. Fletcher and Co., Messrs. H. Greene and Son exhibited the "Meteor" (Westphal's patent) and other improved lamps.

THE STREET LIGHTING ARRANGEMENTS OF THE OLDHAM CORPORATION.—Last Thursday a conference of Local Boards supplied with gas by the Oldham Corporation was held at the offices of the Failsworth Local Board. The object of the meeting was to consider the action of the Corporation in regard to the lighting of street lamps and public buildings in the borough. It is contended that by doing this free of charge, the amount of gas profit is reduced by about £14,000 a year. The last Improvement Act, it will be remembered, limited the profits of the Corporation to a certain percentage per annum—the price of gas being reduced when the limit is exceeded; and the Local Boards contend that they suffer by the Corporation thus acting, as they believe, contrary to the spirit of the Act. The conference had before them a "case" for presentation to Counsel; and it was unanimously adopted.

NORTHERN COAL TRADE.—There has been much more activity and steadier prices in the coal trade during the past few days than recently. Some heavy contracts are in the market for Russia, which will give animation to the trade when they are allotted in a fortnight. For steam coals, the price is about 9s. 6d. to 9s. 9d. per ton. For small steam coal, the demand is considerably larger; and as some of the collieries are now producing less coal of this class, the price is increased to about 3s. 6d. per ton, free on board. The London Gas Companies seem to have been taking less coal of late; but last week their requirements were greater. The quantity of gas coal exported is larger; and the collieries are now working very fully. For smithy coal the demand is good, and the price for best sorts remains about the same as that for best gas coal—8s., less 2½ per cent., free on board. The general tone of the trade shows improvement; and after the holidays, full work must be expected for some time, as the Baltic shipments will then begin in earnest.

LONG EATON WATER SUPPLY.—An inquiry has just been held before Mr. S. J. Smith, C.E., one of the Inspectors of the Local Government Board, upon a scheme of water supply for the district of the Long Eaton Local Board. It is proposed to sink a well in the millstone grit formation in the parish of Melbourne, Derbyshire, near Swarkestner Bridge, about ¾ mile from the River Trent, and to pump the water through 5½ miles of main to a reservoir on Windmill Hill, at Castle Dorrington, which is 5¾ miles from the Market-Place at Long Eaton. The lift to the reservoir will be about 230 feet; and the effective pressure in the streets at Long Eaton will be about 220 feet. An interesting series of borings have been made throughout the Trent Valley; and the site ultimately selected promises well for affording an abundant supply of water, which Dr. Tidy pronounces to be of very excellent quality. The leading mains will pass through King's Newton, Castle Dorrington, and Sawley, and will cross the Trent at Sawley Bridge; and as they also pass within ¾ mile of the town of Melbourne, negotiations are in progress for enlarging the scheme to afford a supply to all these places. Mr. G. Hodson, M. Inst. C.E., is the Engineer. A very elaborate report upon the selected site and the district generally, by Mr. De Rance, F.G.S., was read and put in; and in concluding the inquiry, the Inspector complimented the Board on the complete nature of their scheme, and announced his intention of reporting favourably upon it. He afterwards made an inspection of the whole line of the works, and of the sites of the intended reservoir and pumping-station.

Miscellaneous News.

THE LONDON COUNTY COUNCIL AND THE GAS AND WATER SUPPLY OF THE METROPOLIS.

TESTING GAS BY THE PORTABLE PHOTOMETER.—THE PROPOSED APPLICATION FOR POWERS AS TO WATER SUPPLY.

At the Meeting of the London County Council last Tuesday—Lord ROSEBERY in the chair—a discussion took place on the following motion, which, as stated in the JOURNAL a few weeks since, had been put upon the paper by Mr. Benn:—"That it be referred to the Sanitary and Special Purposes Committee to consider and report on the desirability of the Council applying to the Board of Trade to introduce a Bill in the present session of Parliament to legalize the use of a portable photometer for testing the lighting power of gas in parts of London remote from any official testing-place."

Mr. BENN, in moving the resolution standing in his name, explained that one of the most important duties which had devolved upon the Council was the testing of the quality of the gas supplied to London. For this purpose about twenty stations had been established under existing legislation—a number which he considered to be too small; and three Gas Referees and a great many Gas Examiners had been appointed to carry on the work. So far as the gas which passed through these testing-stations was concerned, the quality seemed to be all that could be desired. But about five years ago the officials connected with this department of the business of the late Metropolitan Board of Works, which had been taken over by the Council, came to the conclusion that the gas supply in certain portions of London which were remote from the stations was not so satisfactory. They therefore proceeded to test the lighting power of the gas in various parts of London with a portable photometer; and he had obtained this singular fact—that, taking the average of what he might call these "perambulating" tests for the five years which had elapsed since that instrument was sent out about London, something like 43 per cent. of the tests were below the proper quality. But, coming more immediately to the period over which the influence of the Council extended, he had taken out the figures for the three months of December, 1888, and January and February, 1889; and he found that the average of these perambulating photometric tests showed the gas delivered to the consumers in London to be ½-candle power lower than it should be. This might seem a very trifling matter. He had, however, taken the trouble to total up the figures; and he found that that ½-candle power short for three months represented a sum of no less than £21,000. He therefore looked upon the matter as a very important one, which demanded immediate attention, particularly as the Board of Trade had been dallying with the subject for something like five years. The position of the Council in connection with the matter at present was very ridiculous. They had to pay a lot of money for these portable photometers, and for a staff to go about London with them; and yet up to the present time nothing had been done to make these portable tests legal. He might say, to the credit of the late Board of Works, that three or four movements had been made by them in this direction; but up to the present nothing had been done. The Council would doubtless be told that the matter was being considered by the Board of Trade, and that they were carefully watching the matter. They would also be told that these tests were unsatisfactory; and that, as this question was already under official consideration, it might be put off. But he must tell the Council that these tests were the only legal ones known. They were approved by the Gas Referees; and, if anything, were in favour of the Gas Companies. When the Council considered the interests involved in these Companies, they would understand how it was that the matter had been delayed for five years; and he hoped the Council would not allow the "red herring" of official delay to interfere with the consummation of so desirable a matter.

Mr. J. BURNS seconded the motion, though not entirely for the reasons which the mover had given for it. Mr. Benn had referred to the tests which had been carried on at places remote from the official testing-stations; but if he had pressed his inquiry a little further, he would have found that in nearly every one of the gas-works in and around London, up to eleven or half-past eleven at night the gas was supplied to various districts of a certain candle power short—½-candle power less than that required by law—and that between half-past eleven at night and four or five o'clock in the morning, it sometimes was 4 candles below the requisite standard. This he was in a position to affirm from personal knowledge gained while he was employed in a gas-works. He contended that it was time the Council, in the interests of the people of London, took some steps to guarantee gas not only of good quality, but supplied under better conditions than it was at present. One of the best means of attaining this result was the adoption of the motion.

Mr. PARKINSON opposed the motion, and said the subject was one which had been under the consideration of the Board of Trade for some time. They had taken the best evidence they could obtain on the matter; but still they found it impossible to bring forward an arrangement which would be satisfactory and just to all parties. There was considerable difficulty in regard to the question of photometers—a difficulty in defining exactly what the standard should be with which the gas should be compared. On the Continent they did not use candles, but employed lamps; while in this country candle power was adopted as the test. And yet all engineers agreed that nothing could be more unsatisfactory as a test for gas lighting than the candle. If they went to some of the testing-stations, it would be found that there were different standards adopted for the purpose of comparing the gaslight. In order to get at a satisfactory standard, Mr. Vernon Harcourt, one of the Referees, had invented a system of testing; and various engineers had put forward other methods for the same purpose. The whole matter was in such a condition that it would be unsatisfactory to move that portable photometers should be legalized. Tests had actually been made of the same gas at the same testing-places with two different photometers; and one had showed the gas to be above, whereas the other showed it to be below the standard. This proved the uncertainty of such tests, which depended upon so many varying circumstances. And, of course, if there were these difficulties in the way where they had a permanent photometer established, how much greater must be the chances of error with one that was moving about different parts of London in all sorts of temperatures and varying circumstances. He thought that the proposal of Mr. Benn was practically impossible for any useful purpose. As to the suggestion of Mr. Burns, it was one utterly unworthy of the serious consideration of the Council. It was impossible to imagine that the Gas Companies, sending out the gas from their large holders, could arrange that it should come out of one quality at one part of the day and of a different quality at another part. However, the question was in a condition which it was difficult to definitely settle, although it was true that it was very unsatisfactory.

Sir T. FARRER agreed with what the last speaker had said as to the Board of Trade, but not that the Council should leave the matter in abeyance. He was inclined to think, from what he knew was going on at the Board of Trade, that if they could not produce a perfect standard for gas testing, they could produce a much better test than the present. Further, he was disposed to believe that the difficulty the Board of Trade felt was not so much about the standard as in respect of the opposition which the standard might receive from some of the Gas Companies. It should be remembered that in fixing the standards it was not a question affecting London alone, but the whole of the United Kingdom and all the gas undertakings. The subject, therefore, was a very important one. Although he was not quite sure of the best way of approaching the Board of Trade, he was inclined to think that the President would not be unwilling, if the Council brought pressure to bear upon him to induce him to do so, to bring in a Bill which had long been in preparation, and would be glad to be assured of the support of the Council.

The motion was then put, and carried by a large majority.

Mr. C. HARRISON submitted the report of the Parliamentary Committee, which contained the following reference to the question of water supply:—"In connection with the amendment of the Bill [The Local Government Act, 1888], your Committee, in pursuance of the resolution of the Council of the 19th ult., have considered whether the requisite powers to enable the Council to make applications to Parliament in relation to the water supply cannot be obtained by some Bill presented by the Council this session. The Council has no Bills in which it would be practicable to seek the desired powers, except the London Council Bill, and the annual Money Bill, in neither of which do your Committee think it advisable to insert the necessary provisions. After careful consideration, they have arrived at the following conclusion, which they submit for the approval of the Council:—That the best way of obtaining the object proposed by the Council's resolution of the 19th of March is to embody in a second amending Bill proposals for extending the powers of application to Parliament given by section 144 of the Metropolis Local Management Act, 1855, to matters affecting the water supply, and to include provisions for the costs of inquiry in the Money Bill of this session. If the Council approves the above resolution, your Committee recommend —'That a separate Bill be introduced into Parliament for conferring powers on the London County Council to introduce Bills relative to the water supply, and that the matter be referred back to the Parliamentary Committee, with instructions to prepare and submit such a Bill to the Council.'"

The question was referred back to the Parliamentary Committee.

PARTICK, HILLHEAD, AND MARYHILL GAS COMPANY.

An Extraordinary General Meeting of this Company was held last Thursday—Mr. HENRY COWAN presiding—for the purpose of considering the special resolution which was given at length in last week's JOURNAL (p. 675); its object being to authorize the Directors to issue debenture stock or annuities to the extent of £80,000 (for which amount borrowing powers are at present possessed by the Company), at a rate of interest not exceeding 4 per cent. per annum in perpetuity, and to issue the stock from time to time on such terms and to such persons as they might think fit.

The CHAIRMAN said that the circular which had been issued to the shareholders fully explained the nature of the transaction which had called them together. The debentures falling due, as they did just now, had been a source of great anxiety and danger to the Company. The Directors had been trying to do their best to get rid of the debenture debt of the Company; and he urged upon the shareholders to adopt the resolution submitted to them by the Directors.

Mr. H. A. BEGG remarked that he thought there was no difference of opinion among them that the step proposed by the Directors as to the issue of debenture stock was a wise and good proposal. The only objection which he had was that it appeared to him they had not received the full particulars of the agreement with the party or syndicate willing to take up the debenture stock. The Directors should have offered the stock which it was proposed to create in the first place to the shareholders. The shareholders should be informed of the exact terms of the agreement; and if there was any price attached to the stock at which it could be made redeemable at the option of the Directors. He considered that within the next two or three years, the Glasgow Corporation would have to purchase their works. He further remarked that the Town Council could borrow at 3 per cent. against the 4 per cent. that the Company were going to pay if the resolution was carried; and the question came to be whether, when the works were valued, it would not handicap the shareholders when the money came to be divided.

The CHAIRMAN stated that he was not in a position to answer Mr. Begg's questions as to the terms of the agreement, or the party concerned in it; and as to the statement regarding the Glasgow Corporation, he said that it would be within the next year or two that the concern would be bought up, if at all) and in that time few debentures would be issued.

Mr. BEGG observed that he had not made his remarks out of any hostile spirit, but for the good of the shareholders.

The CHAIRMAN stated that the Directors had studied the interests of the shareholders, and that they were of opinion that, if the shareholders passed the motion which he was about to make for the issue of the debenture stock, it would place the Company in a much better position; and he would unhesitatingly say that, if they did not agree to the proposal, they would put the Company in a curious and dangerous position.

Mr. J. D. HEDDERWICK thought it would only be reasonable that the shareholders should have an opportunity of subscribing for the debentures to be raised; while it was but fair that they should have time to consider the subject. He moved that the stock be first offered to the shareholders for subscription.

The CHAIRMAN stated that such a motion could not be put to the meeting; and he then formally submitted the resolution contained in the circular issued to the shareholders.

The motion was seconded by one of the Directors; and a long, and occasionally bitter discussion took place, chiefly led by Mr. Begg, who asked that the meeting should be adjourned for a fortnight or three weeks, so as to see whether or not the shareholders would be inclined to subscribe the debenture stock proposed. The Company's legal adviser, who was present, thought that an adjournment of the meeting was quite in order; and after the proposal was seconded, and a further discussion took place, a show of hands was given in its favour by the shareholders present, without regard to the proxies held by the Secretary. The meeting broke up in confusion; and several shareholders signed their names for stock amounting to £6000. It was informally agreed that the shareholders generally should be canvassed on the subject during the fortnight elapsing before the holding of the next meeting.

THE VYRNWY WATER-WORKS.—At a meeting of the Liverpool Corporation Water Committee yesterday week, the Water Engineer (Mr. G. F. Deacon) reported that the construction of the tunnel underneath the Mersey, and the other works in connection with the aqueduct were progressing satisfactorily. The water, he said, was continuing to flow into the lake at Vyrnwy, which now contained 7000 million gallons.

ANTWERP WATER-WORKS COMPANY.

The Annual General Meeting of this Company was held last Thursday, at the London Offices, 86, Cannon Street, E.C.—Mr. Edward Horner in the chair.

The Secretary (Mr. W. Conway) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the statement of accounts for the year ending Dec. 31 last. These showed that the income of the Company from all sources amounted to £19,114 18s.; and after deducting all working expenses, the cost of laying on services, and debenture interest, the net revenue was £7363 18s., which, added to the balance of £1660 13s. brought forward from the previous accounts, and charging 5 per cent. of the net profits for the purpose of a reserve fund, left the sum of £8626 available for division, out of which the Directors recommended that a dividend be paid at the rate of 2½ per cent. per annum (free of income-tax), and that the balance of £1126 be carried forward.

The Chairman, in moving—"That the Directors' report and the statement of accounts be received and adopted, and a dividend of 2½ per cent. on the share capital of the Company, free of income-tax, be paid forthwith," said that the position of the Company was very satisfactory, and that everything connected with it was improving. Among the number of things the Directors had to consider was the quality of the water; and the shareholders would perhaps be surprised when he told them that during the past year they had not received a single complaint in regard thereto. The Company's Chemist and Engineer considered that they had now discovered means by which the water was made as pure as was possible. In regard to the quantity of water pumped last year, it was less by 324,000 metres than in the previous twelve months; so that they had managed to save an enormous amount that had been previously lost by leakage, &c. The quantity of water consumed for street watering and other purposes also fell considerably, owing to the wet season they had in Antwerp last year. The consumption of water, by the exertions of their officers, had fallen from 23 gallons to 19 gallons per head per day—a saving of 4 gallons each day upon every individual consumer. This was the result of the great pains that had been taken during the year to prevent waste. The cost of pumping was slightly higher in the past year than in the previous one; and the total working expenses had increased slightly. The general accounts were much the same as in former years. The Directors had been rather fortunate in getting some of their debentures which had fallen due during the year taken up at a rate of interest 1 per cent. less. This of itself would form a good item in the next accounts. The number of ships that had been at Antwerp had been somewhat less; but the Company had been able to get better prices from them for water. In conclusion, he said the concern was in a good position now; and if the Board could only get the town to do what they wanted them—that was to take the terms of the Company's concession into consideration—it would put it in an enormously improved position. The dividend they proposed paying was, as would be seen, ½ per cent. higher than before.

Mr. D. Evans seconded the motion.

The Chairman, replying to a question, said they could not go into full particulars as to what the negotiations with the Municipality were; but he might say that they were trying to get the concession extended; and then they would not require to place so much money away to recover the capital. The town would also benefit by the proposed arrangement.

Mr. Weir made some comparisons of figures in the accounts for last year with those for 1886. He pointed out that salaries had increased; and that stocks, which stood at about £5000 in 1886, were now at £8000. In 1886 they had done £4000 worth of work, and in the past year only £1700; and yet last year they required a larger amount of stock than in 1886. It seemed to him that there was something radically wrong with the management of the Company; and he thought they required more energy on the Board. As a protest against the way in which the business was being conducted, he should vote against the re-election of the retiring Directors, though he had nothing to say against those gentlemen personally. He also suggested that interim dividends should be paid.

The Chairman said it was necessary that they should have a large stock in hand for the amount of work they now had to do. They laid a large number of mains during the year to extend the business of the Company; and these had been taken out of stock.

Mr. Evans said that the Company were now selling water by meter in Antwerp. The inhabitants were willing to take water in this way; but they would not purchase the meters; so the Company had to supply them. They were put down to stores account; and this made it much larger.

The Chairman said the payment of interim dividends was a matter the Directors would have to take into consideration. As far as he was concerned, he was in favour of having interim dividends.

The resolution was then unanimously carried.

On the motion of Mr. H. G. H. Norman, seconded by Mr. C. Crew, the retiring Directors (Mr. D. Evans and Mr. G. F. Smith) were re-elected; the only gentleman voting in opposition being Mr. Weir.

The Auditors having been re-appointed, a vote of thanks was passed to the Chairman and the Directors, and the proceedings terminated.

KIMBERLEY WATER-WORKS COMPANY, LIMITED.

The Ninth Annual General Meeting of this Company was held last Wednesday, at the Cannon Street Hotel, E.C.—Mr. G. F. Smith (in the unavoidable absence of the Chairman, Mr. A. J. Macdonald) presiding.

The notice calling the meeting having been read, it was agreed to take as read the report of the Directors. This stated that the profit and loss account showed a credit balance of £51,209. After paying an interim dividend of 5 per cent. and interest on debentures, writing off £12,357, including £10,000 from construction account, and bringing forward £2913 from the last account, there remained an available balance of £20,344, out of which it was proposed to pay a further dividend of 5 per cent. (making 10 per cent. for the year ended Dec. 31 last); leaving £4594 to be carried forward. There was a reduction in receipts on water account of £11,738. Against this, however, there was a decrease of £7013 in the ordinary working expenses; and the Directors hoped to make still further improvements in this direction. During the year a Bill was passed through the Cape Legislature, having for its object the establishment of a competing Water Company. After some negotiations, however, the Directors came to terms with the promoters—the De Beers Consolidated Mines, Limited—and acquired their concession.

The Chairman, in moving the adoption of the report and accounts, said he should like to make a few remarks with respect to the portion of the former which dealt more especially with what was called the Beaconsfield Concession. The De Beers Consolidated Mines Company obtained the Bill that they applied for to the Cape Parliament. During the passage of the Bill through Parliament, the interests of the Company were well represented. The outcome of the passing of the Bill was that the Board entered into an agreement with the De Beers Company for the purchase of the concession; and the amount they had to pay was £10,000—the terms being that the De Beers Company on their part bound themselves to oppose the establishment of any company having similar objects to those of the Kimberley Company throughout a period of 25 years commencing from Dec. 1 last. Another clause in the agreement was that they were to supply the De Beers Mines, or any other mines they might subsequently acquire, with water for mining purposes at the rate of 8d. per 100 gallons. The Board were satisfied with the bargain they made; and they hoped they would not be molested again during the term of their concession. Turning to the working of the year, they had to deplore a decrease in the supply of water of rather more than 20 million gallons, as compared with 1887. It was, however, pleasing to be able to report that, for the first three months of the current year, they had half that amount in excess of the 20 million gallons—that was to say, if they continued during the year at the rate they had done in the first three months, they would have an increase of 40 million gallons, instead of a decrease of 20 millions. On the whole, he thought they might take it that they had a very prosperous career before them; and although they were now proposing a dividend of 2 per cent. less than was paid last year, he thought this was the minimum the shareholders would receive hereafter. They might take it for granted that, as the shareholders' interests were those of the Board, they would do their best to make the dividend as much as they reasonably could.

Mr. J. Jackson, in seconding the motion, observed that he had a few words to say by way of supplement to what the Chairman had stated in regard to the great change that had taken place in the Company's circumstances during the past twelve months, and also with reference to the events attending that change—events which caused the Directors grave anxiety at one time, and, indeed, imperilled certainly the success, if not actually the existence, of the Company. Directly they became prosperous, and declared a dividend of 15 per cent., the cupidity of opponents was aroused. Their former Manager (Mr. T. Lynch) introduced a Bill into the Cape Parliament which they were successful in defeating. Certainly it was thrown out on a technical objection. During the succeeding months, Mr. Lynch succeeded in gaining the influence of the De Beers Company; and they (the Kimberley Water Company) found themselves confronted with a different kind of opposition. The Directors saw they would have great power brought to bear against them; and they strained every nerve to successfully contend with it. They fought the Bill which was again introduced; and they firmly believed that the Cape Parliament would have backbone enough to at any rate protect those rights which they themselves gave to the Company. The De Beers Company, however, proved too much for them; and the Government were so determined that this Private Bill should be passed, that they actually postponed the prorogation of Parliament in order to pass it. The De Beers Company having obtained their Bill, the Directors, in the interests of the shareholders, came to the conclusion to enter into negotiations with that Company. This they did, with the result alluded to by the Chairman. In the negotiations they gained most of the points for which they contended, with the exception of raising the price. Of course, the reduction in price represented a great loss to the Company; and the Board found that it was something like £11,000. The only way this could be made up was by strict economy. They had already introduced considerable economies. During their prosperous years, they had been in the habit of allowing a supply of water for houses and gardens at a fixed rate; but they would have to discontinue this now, and put meters on their house supplies. The householders naturally raised an outcry at this. It was, however, not their fault, but that of the De Beers Company, who had forced the position upon them.

Mr. Finlay asked whether it would be possible, in the event of any dissatisfaction on the part of the inhabitants of Kimberley, for them to start a Company, because, seeing that the De Beers Company were successful, they might try their hands at it; and the Cape Parliament might possibly sanction another Bill.

Mr. Bovil remarked that the Chairman had said the Company were well represented in the Cape Parliament at the time of the passing of the De Beers Company's Bill; but with that he could not agree—the result showing that they were not well represented. A more tyrannical proceeding than that perpetrated by the Cape Parliament could not possibly be conceived. He should like to know how far they were secured against anything of the kind in the future.

The Chairman, in reply, said that the De Beers Company would oppose the establishment of any company having similar objects to those of the Kimberley Water Company; and he thought this guarantee was good enough. He did not know of any instance, with the exception perhaps of Amsterdam, where a dual supply existed. As to Mr. Bovil's remarks, he (the Chairman) thought the Company were very efficiently represented in the Cape Parliament during the passage of the Bill. Mr. Macdonald, their Chairman, was there; and they had the best men to represent them.

The motion was agreed to.

On the proposal of Mr. Powell, seconded by Mr. Haynes, the retiring Directors (Messrs. D. Macdonald and A. von André) were re-elected.

The Auditors were also reappointed; and the proceedings then terminated.

The Public Lighting of Gateshead.—A deputation from the Gateshead Corporation waited upon the Directors of the Newcastle and Gateshead Gas Company on Wednesday. They desired that the Corporation should be placed on the same terms as the Newcastle Corporation in regard to the supply of gas for the street lamps. The Newcastle Corporation paid 1s. per week for each street lamp, less 20 per cent. reduction; while the Gateshead Corporation paid 1s. for each lamp, but were allowed only 10 per cent. reduction. This the deputation considered to be unfair, especially as the Company was known as the "Newcastle and Gateshead Gas Company." It was thought the two towns should be placed on an equal footing. The Directors promised to give the subject their careful consideration, and to forward their answer at an early date.

The Differential Gas-Rate of the Salford Corporation.—Another meeting of the representatives of local authorities and private consumers situated within the area of the Salford gas supply was held at the Victoria Hotel, Manchester, last Tuesday afternoon. A letter was read from the Town Clerk of Salford, dated the 5th inst., intimating that the question of the differential rate had been under the consideration of the Gas Committee on the previous evening, but that no decision was come to with regard thereto—the question being adjourned for further consideration. It was reported that the Salford Town Council had decided to transfer £41,000 from the gas depreciation fund to the three district funds. No definite line of action was agreed upon with regard to applying for a *mandamus* to prevent the transfer; but an opinion was expressed that it was improper and illegal. A resolution was passed, and authorized to be forwarded to the Town Clerk, saying that the conference had adjourned until the receipt of the Committee's decision, which they hoped would contain the announcement that the differential rate had been abolished. It was stated by one speaker that the Chairman of the Gas Committee (Mr. Lord) sympathized with the out-districts in their desire for the abolition of the rate; and another said he had it on the authority of a member of the Gas Committee that it was within "measurable distance" of being done away with.

ELECTRIC LIGHTING IN THE METROPOLIS.

BOARD OF TRADE INQUIRY.

(*Before Major* MARINDIN, C.M.G., R.E., *assisted by Captain* CARDEW.)

THIRD DAY—FRIDAY, APRIL 5.

Mr. *Ferranti's* cross-examination was continued by Mr. MOULTON; and the witness said he wished to correct something he had stated on the previous day, when they were speaking of 10-candle lamps He gave 100,000 lamps; whereas he should have said 100,000 20-candle lamps, or 200,000 10-candle lamps.

Major MARINDIN: Will you make it quite clear whether they are all to be alight at once?

Witness: The idea is this—that in the winter you may take the total lighting of the London stations as regards the working machinery, supposing it runs night and day, as ten hours of a rated capacity station. The winter period is the time I take, as it is the worst time for having the coal; and at this rate, it is 200,000 10-candle lamps—that is, 10,000-horse power. I reckon to use 200 tons of coal a day; it would be under 5 lbs. of coal per indicated horse power.

In answer to Mr. MOULTON as to the construction of the mains and the amount of volt pressure, witness stated that his experience of the transformer system had not extended over many years; but from what he knew, he did not believe it would break down. It had not been actually tried in public. Having answered further questions of detail as to the Company's system, witness said that it was proposed to connect at the Deptford end, but to insulate along the line so as to prevent interference with the telegraphic and telephonic communication. They would put to earth at one end; but there would be no dangerous shock. If they got at the copper, there would be a 100-volt shock; but that was nothing serious.

Mr. MOULTON: I understand that you object to the Board of Trade or the local authorities providing testing-stations other than at your distributing-stations?

Witness: Yes, we do.

Cross-examination continued: The distributing-stations would not greatly assist persons to judge what the pressure was in the mains some distance away. Therefore they would not enable the local authority to take means to see that the proper pressure was given to the customer's house. If there was not sufficient pressure, the lighting would be impossible. He did not object to a clause enabling the local authority to have testing-stations; but he did object to having to pay rent to provide a place for a testing-station. It was not proposed to have a transformer in every house unless required. He had heard that in America the insurance companies did not allow transformers in the houses which they insured.

Mr. MOULTON: In America they only allow them to work 1000 volts?

Witness: Their dynamos have only a power of 1000 volts.

In America they appear to think that the transformer in the house is a danger?—I do not know. In that country they put dynamos on wood.

Cross-examination continued: With regard to their united area, the proposed plant of the Company consisted of dynamos which worked 100,000 lights each; but they had capacity for working 200,000. He considered about one light per head a fair allowance. The present plant would be equal to a population of probably a quarter of a million.

Mr. MOULTON: Do you know anything about the lighting in the City?

Witness: Lord Crawford said it is largely in the day time.

Are there any regulations as to safety with regard to this transformer system? It has not been before the Board of Trade at present?—I was under the impression that this was now being considered.

Major MARINDIN: It is a matter for the Board of Trade to consider.

Cross-examined by Mr. SHIRESS WILL, witness said that having sent the current through the main with the high pressure of 10,000 volts, with the transformer they would reduce it to 2400. There would be a loss of power of about 2 per cent. The loss did not increase in the same ratio as in other systems, because the transformers would be turned off, and would always be worked at their efficiency. Of course, if working materially below their full power, the loss would be greater. Their scheme depended for its success upon their power to carry the current along the whole distance from Deptford.

Mr. SHIRESS WILL: But you cannot point to any actual experience to support you; you cannot point to any pressure of 10,000 volts?

Witness: I spoke of 2400 volts as my own experience.

Mr. WALLACE: Has anyone had experience of this rigid insulating material?

Witness: No absolute experience.

Cross-examination continued: With regard to bringing the mains to Deptford, the length of the main carrying the current to Westminster was between six and seven miles. Up to London Bridge, they would carry all their mains together on the same wall of the railway.

Mr. SHIRESS WILL: In the event of anything happening to the wall of the railway, the whole of London within your area would be in darkness?

Witness: Yes; until we had power to take another route. We have another route by the London, Brighton, and South Coast Railway; but we must lay one before we can another. The whole of the six mains will be laid along the wall. The next will probably come up by the London and Brighton Railway by another route; and if our orders are sufficient, another set by the roads.

How do you propose to cross the roads by these rigid concentric mains? I propose to drop down to the necessary depth in the same way as the gas and water companies do with their pipes.

In answer to Mr. MIDDLETON, witness said that the only difficulties at the Grosvenor Gallery station were at the outset, and arose from the confined space and other disadvantages of position. The chief difficulty was having a sewer which met on each side. They were twice flooded.

Mr. MUIRHEAD: Does your American experience lead you to the opinion that the alternate transformer system is cheaper than the direct one?

Witness: That I cannot say positively, for I have not been there.

Mr. RUSSELL GRIFFITHS (who represented the City in the absence of the City Remembrancer) next cross-examined the witness, who said he did not know how many lamps there would be in the City. He was told that there were over 3000 people who required lights.

Mr. GRIFFITHS: Supposing you light by the arc system, which you say you can do, what is the equivalent of 10-candle lamps which will be required for each street lamp?

Witness: I suppose the electric power would be about 15 candles; or if you want very good arcs 20 candles.

Cross-examination continued: He thought it would be excessive to have that power for every lamp-post. He could not state what the Corporation would be prepared to supply the street lighting of the City for, as he had not studied their particular requirements. During the daytime there would not be such pressure in other parts; so that they could supply the City with 100,000 lights. By the daytime, he meant well into the evening, when everybody had left their offices—about seven o'clock. Up to seven o'clock they would be prepared to supply the equivalent of 100,000 10-candle lights. That would include all the electric lighting which would be required privately and publicly. In addition to this, there would be the street lighting; and any further applications that might be made for private lighting. Their system would not necessarily require a transformer in each house. They could put one in the base of each lamp-post, or have the lamps in series, and have a transformer for each series. He had heard that there was a system of electric lighting in America where they had a transformer for a group of lamps.

Mr. GRIFFITHS: Do you agree with the statement of Lord Crawford that electricity as a motive power will throw into the shade its use for lighting purposes?

Witness: I will not go so far as to say it will throw it into the shade; but the supply as a motive power will be a very profitable one.

Do you think it would be more in demand?—Yes; very much more in demand.

Cross-examination continued: They proposed to first enter London after crossing the river at Cannon Street; and Blackfriars Bridge would be another place. Preparations were in progress for coming over Blackfriars Bridge. They had made an agreement with the Railway Company; and the mains were actually being placed on the bridge. They were not yet being laid over Cannon Street bridge; but arrangements had been made with the Railway Company. It was proposed to take the mains over the bridges in order to get into the Underground Railway; and also for carrying the light into the City. They intended to supply some of the present customers of the Grosvenor Gallery partly from the main there, and partly from the Grosvenor Gallery station. All the electricity would be generated at Deptford. They were going to supply their present customers from the Deptford main. They did not propose to carry any of the wires overhead in the City; in fact, he did not think they could very well. The City was not important; the Company would be better without it.

Mr. GRIFFITHS: Would you sooner not have to do with the street lighting of the City?

Witness: It would be commercially better for the Company to get what it wants without having to supply the City at the price at which they require the light.

Mr. H. WILKIN asked a number of questions with regard to the particular motor the Company intended to use, and as to the economy which it was said would be effected in respect to the price and carriage of coal and obtaining water from the river by having a large central generating station at Deptford. Witness stated that there would be great saving in this respect; and they had made an alteration in regard to some of the details of their system in consequence of the intervention of the Post Office.

Mr. WILKIN: You have abandoned the idea of having bare copper in the ground.

Witness: Yes; it is a refinement of detail.

Have any other "refinements of detail" been made since November?—Nothing is perfection. Installation goes on very rapidly.

Am I correct in assuming that the whole of the current will be generated at Deptford?—Yes, according to our present proposals.

Supposing an explosion took place, and blew up all your engines and dynamos, what would be the position of London as to the lighting in your area?—The position of our area would be very satisfactory, because it would be impossible to blow up all our plant.

Major MARINDIN: Well take the supposition, and suppose the whole of it was blown up.

Mr. WILKIN: I suppose you can imagine it is possible to have a great conflagration or explosion?

Witness: There is nothing which could affect the place as a whole in that way.

But you are not in the position of a gas company with a number of storeage stations. You have not a storeage station at Fulham, Nine Elms, Horseferry Road, Kensal Green, and so on?—No; we are enormously divided, but we have not another storeage station. It is all at Deptford.

And if Deptford was blown down completely, your area would be left in darkness?—Yes.

Professor ROBINSON: Supposing you had an installation at St. Pancras, and the Vestry wished to purchase, how would you propose to deal with it?

Witness: I should say you would take our main, and put down a generating station close to where we had our distributing station.

Mr. SMITH: The Company have abandoned the larger portion of Lambeth; and will you say why you have retained the north part while you have abandoned the south, which is nearest Deptford?

Witness: The idea is to get our mains through to Charing Cross.

Captain CARDEW (Assistant-Inspector) asked a few questions with regard to the method of laying the mains; and the witness replied that the support to them would be continuous, and that where it went to the ground the insulation would be continuous. The conductors, he said, had been tested. With regard to the duplicating of the mains, each large transformer would not be supplied by two mains in the divided circuit. There would be several large transformers on each main; but the transformers of separate mains would not be connected together. The mains would also invariably proceed from different engines.

Mr. H. C. JONES: Would there be any objection to the local authorities providing testing-stations if they themselves bore the cost?

Witness: Not the slightest. I do not see that anything could be said against it. It would be a most desirable protection for the public.

Re-examined by Mr. GRAHAM, witness said his Company were willing to provide as many lights for the City as they were willing to pay for. It was only a question of money. If the authorities of the City would provide the money, they would furnish the electricity. The more the better. Their object was to supply electricity, and to let the public do what they liked with it. The dynamos they were going to use were not an experimental departure. They were a multiplication of smaller parts divided in such a way as to make them a number of small dynamos for all practical purposes. They had had experience of 800-horse power; and this carried them a long way to the 1500-horse power. He considered the advance to 800 was a greater step than the progress to the 1500. Having obtained experience of 1500, they would be in a better position to use the 5000-horse power engine. There was nothing in their proposed system at all of an experimental or extraordinary nature when carefully considered. There was no danger in the use of the system more than the shock of a 100-volt current, and that was not a great shock. He had had it himself several times. As to the desirability of testing-stations, they had not found any occasion for them. No one had referred to them. Each man's house was his own testing-station at present. There was no objection to the local authority or the Board of Trade having a testing-station; but the Company objected to paying for the ground and furnishing the station into which they could go to make the test of the main. As to the question of coal, he based his calculation on his experience of what took place at the Grosvenor Gallery; and this was that 100 tons per day were necessary for supplying electricity to 200,000 lamps.

Mr. *G. R. Strachan*, Assoc. M. Inst. C.E., Surveyor to the Chelsea Vestry, examined by Mr. LOYD, said the Vestry were decidedly in favour of competition in regard to the supply of electric lighting in their area, as they believed the result would be beneficial. So far as his knowledge

went, there was a demand for a supply of electricity in the Chelsea district. His previous experience of electric lighting companies was not very satisfactory. There was considerable delay in the execution of the works; and the Vestry had had to take action to prevent further powers being given to the companies seeking to supply that area. The Vestry had come to the conclusion that competition was for many reasons desirable. It prevented delay in the work. They had consequently resolved to admit three companies into their area provided they could get the necessary Provisional Order. The London Electric Supply Corporation might to a certain extent be said to be acting at the instance of the Vestry.

Mr. LOYD: Have you heard anything of the doctrine of "physical exclusion"?

Witness: Oh, yes. That was put forward by one of the companies; but the Vestry did not at all agree with them. The difficulties have now been overcome; and the mains of the two companies are now lying side by side in one of the roads.

Have you heard anything of the doctrine of "danger"?—Yes. That doctrine was also started, and a large picture of supposed dangers was drawn; but it did not at all frighten the Vestry.

Are the Vestry in favour of the Order of the Electric Lighting Corporation?—Yes.

Professor HUNTER cross-examined witness as to the particular competition of which he said he had had experience; and being requested to state what were the advantages, witness said the companies did their work better, quicker, and cheaper; and served the public better. Of the disadvantages of competition from a public point of view, one would be that the roads would be liable to be taken up twice in each street. A number of companies in a district would mean an additional number of distributing mains. That would be no public disadvantage when they were in. The disadvantage was in getting them in.

In reply to Mr. GRIFFITHS, witness said there had been an agitation in Chelsea against overhead wires. Two companies had been in competition in Chelsea in one of the streets, and had broken up the road together. That was done on purpose; it was strategical. There was no electric street lighting in Chelsea now; and the Vestry did not propose to have any—they knew the cost of it. They inquired into the expense of lighting the Town Hall, not the streets; and it was found to be about three times the price of gas.

Mr. GRIFFITHS: You say you have made a calculation as to the expense of lighting the Chelsea Town Hall with electricity as compared with gas. Upon what basis did you make that calculation?

Witness: I asked all the eminent electric lighting firms to give an estimate for laying down the plant; then I obtained an estimate of the cost of working; and when I considered the whole cost of lighting, none was less than from two-and-a-half to two-and-one-third more than the present cost.

Cross-examination continued: He did not yet understand that two of the companies had Provisional Orders, but had an agreement by which they sought to supply private houses. The one company which had a Provisional Order was not in a position to supply electric lighting. All the electric lighting in Chelsea was at present done by private persons.

Mr. LLOYD: This conflict which you described took place when it was not recognized that there was power for two companies to come to one place?

Witness: Yes; the conflict was strategical. It was done simply to exclude the other company. If it were recognized by Parliament and the Board of Trade that there was to be competition, there would be no such disturbance in the future.

Dr. *J. A. Fleming*, examined by Mr. GRAHAM, said he was Professor of Electrical Engineering in University College, London, and had had experience of electric lighting in the United States, having visited that country in 1884 and 1885, and examined very carefully the systems of lighting introduced there, especially the incandescent system as established by Edison. At that time the transformer system had not come much to the front. Transformers had been tried; but at that date there was no central station on a large scale. There had been an enormous extension of late years in the transformer system not only in the United States but in Europe. In America the reserve power or reserves was embodied in spare engines, boilers, and dynamos—in fact, the bulk of the central station lighting in the United States depended for its continuity on moving machines. There were upwards of 200 central stations in the United States which were all dependent for their reserves and the continuity of their lighting on spare engines, boilers, and dynamos. As to the high tension of the mains in America, between 1000 and 2000 volts was a very usual pressure. There were no insuperable difficulties in insulating high-pressure mains. The higher the degree of the electrical motive forces, the greater, generally speaking, should be the precautions. But there was no running against any law of nature in doing so. His experience was chiefly of New York; and there about 100,000 lights per square mile was the probable number. That was for an average district of shops, houses, and warehouses. The objection against the transformer system—that it was an experiment—depended upon the way the word experiment was used. If it was objected that it was not according to nature, then he disagreed. But if it was used to describe something larger than had ever been done before, then it was an experiment in the same way as the Forth Bridge was one.

Mr. SHIRESS WILL: In America, did you find that they worked on the plan that it is contemplated to commence with at Deptford—viz., to have half the machinery at work, and the other half in reserve; or is it not rather the practice to separate the plant into six or more separate plants, so that if one part breaks down it is only a sixth or an eighth of the whole?

Witness: The general rule is to work with about a tenth of the supply.

Mr. GRIFFITHS: You have told us there are 200 central stations in America. Is that all on one system?

Witness: No; it is divided into an automatic system and a continuous supply.

Cross-examination continued: The stations were central generating stations. He knew of no company in America with a generating station of the extent, or anything approaching that which was proposed at Deptford. No company in America had single dynamos of 10,000-horse power. The largest he had seen was about 500 or 600 horse power; and the general run was 300 or 400. There were mains in America similar to those which the Corporation proposed. The Edison mains there were made in 20-feet lengths.

Mr. *Musgrave Heaphy*, C.E., was next examined, and stated that he was scientific adviser to the Phœnix Fire Office. He had had large experience in fire risks, and had been consulted by the Government and the Board of Trade ever since electric lighting was first introduced in London. He had examined from time to time the transformer system installations. He had heard of the proposal of the Corporation to increase the voltage in their trunk mains by 10,000, and then reduce it to 2400 volts along the mains, and bring it into the houses by transformers. Having considered it from the point of view as to how it would affect insurance companies, he did not consider there would be any danger. From a practical point of view, he should be prepared with the increased voltage to pass an installation in any house—provided the Phœnix rules were adopted—without any increase of premium, because he did not think there would be any additional risk.

Professor HUNTER: Are you aware that the American insurance offices refuses to insure unless the transformers are outside the building?

Witness: I have heard so; but I do not care whether the Americans do so or not. I speak from my experience. I do not care how many say it is dangerous, if I find from long experience it is reasonably safe. Nothing can be absolutely safe. The best illustration I can give is that in our hazardous risks electric lighting on the high-tension system is allowed without the slightest trouble to the consumer, or any extra cost added to the premium; and he is allowed to use gas in a worse form than before. And in my experience, dating from the time of the first transformer, I have never had a single instance of a fire when the installation building was properly fixed up.

Do you think there is any appreciable increase of risk from having the transformer inside the building?—When the Phœnix rules have been observed, we have not had a single instance of trouble.

Major *C. B. Waller*, Manager and Secretary of the London Electric Supply Corporation, examined by Mr. GRAHAM, said they had had applications from outsiders to supply electricity all over the town. There were at this moment on their books 82 applications from the City; 21 from the Strand district; 10 from St. Pancras; 40 from Marylebone; 44 from St. James's; 15 from Westminster; and 65 from various other parishes—making a total of 277. In addition to these, they had many hundreds of applications by letter, which they did not register as permanent. In the majority of the former cases, they were waiting to receive current from the Company. Many of the applications were from large public establishments. As to how many lamps these applications would take, he believed that in round figures they would require about 50,000 10-candle lamps. But the others not considered absolute agreements to supply currents amounted to another 100,000 lamps. If the Company had current for 100,000 lamps, they could place the whole amount in the City at once with private consumers—that was excluding the authorities.

Replying to Professor HUNTER, the witness stated that applications had been received from Chelsea to supply Cadogan Square, Sloane Street, and other parts. He had been receiving applications for the supply of electricity for the last fifteen months.

In reply to Mr. R. S. WRIGHT, witness stated with regard to access for the mains into Chelsea, that the line of route was more or less vague at present. It would probably be along the railway. They had an agreement with the Metropolitan District Railway Company. The number of applications from private persons in Chelsea would be a matter of conjecture unless he looked over the correspondence of the last eighteen months. He drew a distinction between those who simply asked whether the Company could supply and those who requested a supply. The applications did not refer to any particular lighting?

Mr. GRIFFITHS next cross-examined the witness, who answered that, in regard to the applications from the City, they were on forms which the Company had advertised once or twice, and could be obtained from himself. He had no objection to letting Mr. Griffiths see some of those applications from the City. They had undertaken more business than they had been able to do. If found satisfactory, he anticipated the City would take 200,000 or 300,000 lights.

Mr. GRIFFITHS: What is your calculation of the electric light as compared to gas?

Witness: We generally consider that one gaslight is required for each of the population. That is the way we estimate the amount of the current required.

Yes; supposing, as you say, that the gas-lights average one to each head of the population, what proportion of this would the Electric Lighting Corporation expect to get?—That is a pure matter of speculation. If they were all of my opinion, there would be no more gaslight.

If the electric lighting were as you suggest to supersede gas lighting altogether, you would not be able to supply London?—We propose to give from 2,000,000 to 3,000,000 lights.

Replying to Mr. H. WILKIN, witness said that during the last eighteen months some persons had withdrawn from proposals. Some had given it up because it was too expensive; others had been allured from them by the promises of other companies.

Mr. MUIRHEAD, in the course of questions respecting the attitude of the Corporation towards the body he represented (the St. James's and Pall Mall Electric Lighting Company) asked the witness if they did not attempt to "throttle" the St. James's Company?

Witness: No; We attempted to preserve our own lives, and did not fail.

Mr. *Ferranti* was recalled, and was examined by Mr. CRIPPS as to laying down mains in the Strand. He said he had endeavoured, whenever he had the opportunity, to see what was being done when the Strand was up for laying gas or water mains, or anything else. He considered there was a difficulty; and he should not propose to lay a main along the Strand.

Mr. CRIPPS: You think it would be inconvenient to lay a main trunk along the Strand?

Witness: It would be more than inconvenient. It would be better and more satisfactory to lay it along the Embankment, and only come into the Strand where necessary. If we obtained the Provisional Order, we shall begin at once, and commence to lay the necessary mains for lighting the Strand.

The inquiry was then adjourned.

AN ELECTRIC LIGHTING SCHEME FOR WEYBRIDGE.—Last Friday week, a public meeting was held at Weybridge to consider the subject of the public lighting of the town. Mr. H. Yool presided. At a previous meeting a Committee had been appointed to consider the matter; and Dr. Sealy now read their report. They had had before them three systems of public lighting—gas, oil, and the electric light. The Walton Gas Company offered to erect from 50 to 100 lamps for £2 per lamp, complete, and to supply them with gas from Oct. 1 to March 31, from sunset to midnight, at £1 19s. 10d. per lamp. An efficient system of street lighting was, the Committee stated, supplied by means of mineral oil—the Holborn Viaduct, Wimbledon, and other places, being well and economically lit by this method. About 85 oil-lamps, of 35-candle power, with posts, &c., complete, could be erected, lighted, and extinguished for 26 weeks, from dusk to midnight, all responsibility of breakage, &c., being borne by the contractor, for £295. A considerable desire existed in the neigbourhood for electric lighting. An offer had been received to erect the necessary plant and supply the lamps on the incandescent system at 45s. per lamp; the light thus supplied to be available during the summer as well as the winter months, from dusk to (say) 1.30 a.m. The Committee unanimously recommended this method, being most in accord with the age in which they lived, as well as, from every point of view, most economical and desirable. In conclusion, they considered that the rate to be made should be 2d. in the pound, which would produce £240 on the present rateable value of the parish. After discussion, Lighting Inspectors were appointed, with power to make further inquiries—the sum to be expended by them to be limited to £290.

HEYWOOD CORPORATION GAS SUPPLY.

Last Year's Gas Production.—The Coal Contracts.

At the Meeting of the Heywood Town Council last Thursday—the Mayor (Mr. S. Firth) in the chair—the past year's production of gas and the tenders for coal were alluded to.

Mr. Lawton said he hoped to be able to give at the next meeting a proper balance-sheet or working statement in connection with the gas undertaking. During the year ended March 25 last, 76,042,000 cubic feet of gas had been made, as against 75,014,000 cubic feet in the preceding year; being an increase of 1,027,000 cubic feet. In making the gas they consumed during the year 7365 tons of coal and cannel, against 7411 tons in 1887-8. Thus from 46 tons less coal and cannel they had made 1,027,000 cubic feet more gas. Taking this as the basis, if they had used the same quantity of coal this year as last, they would have manufactured another half million feet of gas. He thought the result of the make was so far satisfactory. If the leakage was so much less in proportion, they might expect pretty good results.

Alderman Chadwick drew attention to the advertisement which had been issued in reference to the supply of coal and cannel, which specified that no middlemen or merchants need apply—they were to be boycotted. He thought that if the advertisement had been framed in the usual way it would have been better. Only colliery owners were to send in tenders, which meant that no one in Heywood could do so. Sometimes an agent would do better for them than a colliery proprietor. Some agents, to his knowledge, had a certain percentage; if they could get a large contract from a gas company they might divide the percentage with the company. There must have been a slip on the part of somebody; he did not think the Committee had done it intentionally.

Alderman Marlor said he was surprised to see from the advertisement that tenders were invited from colliery proprietors only. To the best of his knowledge a matter of that sort—as to getting the coal from colliery proprietors—never came before the Committee. They seemed to be boycotting the merchants. To say the least, the advertisement was a mistake, and would not benefit the town.

Mr. W. Bell argued in favour of a public body purchasing from the public, and not applying to any body of proprietors who might become a "ring" and make them pay for excluding the public from the tendering.

Mr. Buckley also expressed his regret at the course taken; and said the idea of the Committee had always been to make the scope of such advertisements as wide as possible. Whoever had made the limitation had not acted in the interests of the Committee; and he for one should protest against it.

Alderman Marlor said he would move to refer the matter back, and that the tenders be not opened, but a new advertisement issued throwing the contract open to the public.

Alderman Lord seconded the motion, and it was carried.

LEEDS CORPORATION WATER UNDERTAKING.

Scheme for Improving the Supply.

With the view of improving the defective water supply to several parts of the borough of Leeds, the Water-Works Committee of the Corporation have before them a scheme, which, it is believed, will cope with the difficulty. The older water-mains—which were small when they were placed in the ground—have become smaller internally by corrosion; and it is impossible to get through them a sufficient quantity of water to adequately supply the steam fire-engines, while the pressure is so weak. To pull up all the old pipes, and put down larger ones, would be a costly process; but this, it is said, will have to be done to some extent. The Committee are engaged in the construction of a new tunnel from Eccup, and have partially reconstructed the Westwood filter-beds, for the town service, with the view of utilizing all the available water from the Washburn watershed. The works, when completed, will enable 20 million gallons of water to be supplied at Leeds; and as the present service is little more than one half this quantity, larger mains will be required to efficiently distribute the water to all portions of the borough. The pressure of water in the present mains is weakened by being drawn upon all along the pipe-lines; and therefore it is intended to lay large mains independent of and outside the old routes, so that water can be sent with force to the farthest extremities of the borough. There are small service reservoirs on various elevated positions round the town; and these will be increased in number. This scheme has been matured by Mr. T. Hewson, the Borough Engineer and Water Manager; and it is believed that it will ensure a thoroughly good service over the whole area of the borough. The total available supply from the Washburn is estimated at 25 million gallons daily. The object of the Water Committee now is to carry out a scheme that will enable them to utilize all the water at their disposal, and to have it distributed in such a way as to be useful to the whole of the inhabitants.

Bewdley in Darkness.—On Thursday night last, owing to the flooding of the Severn, the town of Bewdley was thrown into darkness. The rising waters found their way into the gas-works, and extinguished the fires. The supply of gas was suddenly cut off; and the inhabitants had to resort to candles and oil-lamps.

The Gas Exhibition and Cookery Lessons at Woolwich.—The cookery lectures and exhibition of gas appliances which the South Metropolitan Gas Company held during the past week at Woolwich were in every sense a success. The lectures were given twice each day by Miss H. M. Young, who ably discussed high-class and household cookery. One room was devoted to Messrs. Sugg and Green's lighting appliances, and gas cookers; and in the hall a variety of cooking-stoves were exhibited by Messrs. W. Sugg and Co., Messrs. J. Wright and Co., Messrs. H. and C. Davis, and Messrs. T. Fletcher and Co. The Company intend to hold similar exhibitions at Balham, Dulwich, and New Cross.

Gas Explosion and Fire in the City.—Last Saturday morning, shortly after nine o'clock, an explosion of gas, followed by a serious fire, occurred on the premises of Mr. J. Hodgson, envelope maker, No. 17, Little Trinity Lane, E.C. The machinery on the premises was driven by a gas-engine in the basement; and, according to the reports which have come to hand, some irregularity in connection with the working of the appliance was being rectified when the explosion happened and the fire broke out. Four men were engaged in dealing with the difficulty with the engine, and two of them were so much burnt as to necessitate their removal to the hospital. Immediately after the explosion there was a great outburst of flames in the upper floors, and the building was soon on fire from top to bottom. By eleven o'clock the conflagration was fairly overcome by the efforts of the Fire Brigade; but not until the building had been gutted and some damage done to adjoining property. Sensational accounts of this fire which appeared in the papers on Saturday and yesterday attributed it to the bursting of the gas-bag attached to the engine. We are informed, however, that a representative of the makers of the engine (Messrs. Crossley Bros., Limited) inspected it yesterday morning, and found the bag perfectly sound and the engine fittings intact.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

Edinburgh, *Saturday*.

It is difficult to write with equanimity of the doings of the Arbroath Gas Corporation. After spending nearly a year in considering whether they should or should not extend and improve their gas-works, they resolved, on Monday last, by a majority of 13 to 2, to do no more than build two new retort-ovens at a cost of £150. Of course, they were entitled—perhaps I should say it was their duty—to decide the question in accordance with their opinion as to the requirements of the town and the capabilities of the gas-works. Where I consider they have erred is that they have come to this decision in the teeth of the advice of two as competent men as there are in Scotland. Not only so, but they began by sending a deputation of their number to visit other towns, to ascertain how regenerative firing worked. That is to say, they first made inquiry abroad as to improvements in gas-works; then they employed, in succession, two experts to inform them how best to improve their own works; and having done these two things, they then set themselves to consider whether their works required to be improved. They have arrived at the conclusion that no improvement is needed—only a trifling extension. They must, of necessity, have also come to recognize that the expensive inquiry they have been carrying on was also altogether unnecessary. It is interesting to observe how adroitly the members of the Corporation turn their back upon this aspect of the question, and endeavour to throw what blame there is upon Mr. R. S. Carlow, the Manager. At this meeting Mr. Dickson, one of the supporters of the movement for extension, pointed out how near the wind they were sailing. They had, he said, on Nov. 30 last, only 22,344 cubic feet of gas in stock; on Dec. 7, 27,321 feet; on Dec. 14, 31,248 feet; and on Dec. 28, 7854 feet. Whereupon, at a subsequent stage, Bailie Brown took Mr. Carlow to task for allowing the quantity of gas in store to get so low, and would not accept the answer that the gas had been simply consumed down to that point. Mr. Cargill, one of the leaders of the opposition to the movement, in the same spirit, made the most of remarks which he attributed to Mr. Foulis, that "he was not prepared to say that additional storeage accommodation was absolutely necessary," and that Mr. Carlow was a "luxuriant fellow;" the meaning put upon these remarks being that "everything that was absolutely necessary for the gas-works was there, and working to perfection." Remarks at previous meetings were couched in the same tone. The policy of the Corporation has not been a wise one. It is not creditable to them that, having acted precipitately in going into the inquiry, they should not now own up and take the blame upon themselves. Their treatment of Mr. Mitchell and Mr. Foulis was most unfair, even bordering upon insult. These gentlemen, at the request of the Corporation, submitted reports as to what was advisable to be done. Both reports almost coincided; showing that the defects were glaringly apparent. The rejection of their advice now is therefore equal to an assumption of superior knowledge on the part of the gentlemen who make up the Corporation. They do well to keep the reports by them, because they may find it difficult to procure the advice of an expert after what they have done on this occasion. The question which puzzles me is what reason there can be for the peculiar conduct of the Corporation. One gentleman referred to the electric light as likely to be introduced into factories, which would reduce the consumption of gas; and the case of a manufacturer at Bervie was cited. The truth about the Bervie installation is that the proprietor of the mill considers the cost of the electric light to be less than that of gas, "seeing he has the steam power, at any rate, for his mill." In Bervie gas is 8s. 9d. per 1000 cubic feet. Last year it was 9s. 2d.; and there need, therefore, be little surprise that the electric light should cost less than gas. In Arbroath gas costs about half what it does in Bervie. The introduction of the electric light into Arbroath is consequently out of the question. Mr. Carlow wanted to improve the gas-works; whereby a saving of £300 a year would have been effected, perhaps more; and the Corporation would have been stronger to fight the electric or any other light. They prefer, however, the policy of waiting to see how the attack develops before they do anything to prepare for it. Mr. Carlow showed wisdom and foresight in seeking to do the best for the community in the meantime, assured that that is the best preparation for eventualities; but the Corporation could not rise above what is most unquestionably a penny-wise and pound-foolish policy. The pity is that the results of that policy are not likely to fall upon the members of the Corporation personally, but upon the ratepayers.

Two things have been done in Edinburgh this week in connection with the water supply which are worthy of notice. The first is in connection with a personal affair between the Editor of the *Scotsman* and Mr. Coyne, the Water Superintendent. It mentioned on a former occasion that immediately on the *Scotsman* stating in a leading article that a consumption of 41 gallons per head per day was too much, Mr. Coyne caused a meter to be put upon the supply-pipe to the Editor's house, with the result that from the 7th to the 27th of November, the average consumption was shown to have been 85·2, and the maximum 97·5 gallons per head per day. Feeling the sting of this, the Editor cast about for a means of counteracting the effect of Mr. Coyne's figures; and ultimately he adopted the following plan:—The cisterns were filled, and then the supply from the main was cut off. After the cisterns had partially emptied, the amount consumed was ascertained by measurement, and they were re-filled. That went on from the 10th to the 23rd of January; and the result, as brought out by "a competent man," was to show a consumption at the rate of 30·65 gallons per head per day. There was such a discrepancy here, that the editor insisted that the test made by the water officials was erroneous. To this they replied that the meter was tested before and after use, and was found to register correctly. The Editor then requested that an independent party might be appointed to ascertain which of the two sets of observations were correct. The Water Trust on Thursday, without comment, declined this request, as no good purpose would be served by it. The other affair has reference to that touchy subject, the working of the Deacon and Siemens meters. There had been complaints that Mr. Coyne was interfering with the working of these meters; and he was instructed by the Trust to cease doing so, and to take his instructions from the Engineers—it being the desire of the Trustees that both should receive a fair trial. What the interference was I cannot say; but evidently it was something which Mr. Coyne considered he had a right to do in his management of the water supply.

[In the paragraph in our correspondent's "Notes" last week, referring to the Dundee Corporation gas undertaking, the increased production of gas—mainly resulting from the improved apparatus introduced by the Engineer and Manager (Mr. John M'Crae)—up to Saturday, the 30th ult., as compared with the make up to the corresponding date in the previous year, was given as 20,000 instead of 20,000,000 cubic feet.—Ed. J.G.L.]

(FROM OUR GLASGOW CORRESPONDENT.)

Glasgow, *Saturday*.

By way of supplement to the report of the proceedings at the special meeting of the Partick, Hillhead, and Maryhill Gas Company on Thursday

[given in another column], I may mention that it was stated yesterday afternoon that Mr. H. A. Begg, who was the leading opponent of the proposal of the Directors as to creating debenture stock to the extent of £80,000, had himself secured subscriptions for about one-third of that amount amongst the shareholders. It was further reported that Mr. J. D. Hedderwick, another prominent speaker at the meeting of the shareholders, and himself a member of a leading stockbroking firm, was ready, with the assistance of a few friends, to take up the whole of the £80,000 of debenture stock wanted by the Directors. It does seem to be rather amazing to find these gentlemen and other shareholders who ranked amongst the "opposition" at Thursday's meeting so greatly concerned now to have the opportunity to take up perpetual debenture stock at 4 per cent. interest, considering the fact that they were formerly notified every half year that the Directors required subscriptions for terminable debentures for three to five years bearing interest at 4½ to 5½ per cent. However, we shall see if these gentlemen and their friends are really able to raise the money that the Directors of the Company want; and if they are wiling to extend the opportunity of subscribing to all the shareholders, as they said they were last Thursday. They did not subscribe for the terminable debentures when the money was much wanted a couple of years ago, more or less; but it should be remembered that the Company was then in difficulties, whereas it is now in a highly flourishing condition. In this connection I ought to mention that the Company's ordinary shares were again purchased on Thursday at 95s. per share, and that business was done on the same day in the preference shares at £5 13s. 9d. per share.

This day week, at Alexandria, Dumbartonshire, there were exposed for sale sixty-nine £5 shares in the Leven Gaslight Company. They were put up in lots, beginning at £6 per share; and after a lively competition, the price rose until £8 14s. per share was reached, at which price the whole of the shares were knocked down to a Dumbarton gentleman. There were many local competitors anxious to purchase, and a considerable amount of dissatisfaction was manifested when it became known that a person not resident in the district, and not a local gas consumer, should have become the purchaser. It may be of interest to state that this Company have for some time been paying interest at the rate of 8 per cent. per annum. Further, by way of showing how the shares have increased in value, it may be mentioned that when the shares in question were obtained by the late holder they could not realize more than £115. A number of years ago the shares increased in value threefold; the Company's works and undertaking generally being so much more valuable. The sum realized for the shares last Saturday amounted to £600 6s. against £115—their original cost. This does not include the large dividends paid from year to year. As regards last Saturday's sale, it is stated that according to certain reservations in the conditions of sale, the result of last Saturday's dealings was submitted to a meeting of the Directors of the Company held on Tuesday evening, and that they, having a reserved right of re-allocating the shares to gas consumers resident in the district, did not confirm the sale. They then sold the shares to local consumers at the price realized at the sale—viz., £8 14s. per share. That was a case of completely "turning the tables."

Last Monday the Renfrew Town Council had the minutes of their Gas Committee under consideration. They contained a report on the retort-house and bench at the works, by Mr. Hamilton. He recommended the demolition of the whole retort-house, and the rebuilding of it with brick; the cost of the repairs amounting to £535. He also gave an alternative plan, which was to take down the back wall of the retort-house and rebuild a 14-inch brick wall beyond the present line, and renew with new retorts the four ovens and the two ovens at present working, and build a new bench of two ovens, one with three and one with two retorts, which would serve their wants for a year or so. The cost of these alterations would amount to £220. The Committee, having considered the reports, were of opinion that it would be cheaper in the end to take down and rebuild the present retort-house and retort-bench. They further recommended that power should be given to them to employ a practical gas engineer to draw out plans and specifications of the work, and advise the Committee as to carrying out the same. The Committee also recommended that steps should be taken to discover and repair the leakage in the small gasholder tank, and that power be given to them to carry out this recommendation. They had under consideration the appointment of a Gas Manager, and recommended that a practical working Manager be advertised for. The report was discussed at considerable length, and it was ultimately resolved, on the motion of the Provost, to defer further consideration of the matters dealt with until the Clerk should communicate with the Paisley Gas Corporation, and ask if they were willing to supply Renfrew with gas, and, if so, at what cost.

The Johnstone Burgh Commissioners met last Monday night, and when the gas minutes were up for consideration it was resolved to proceed with the erection of new retorts, with the view of improving the manufacturing powers of the gas-works, but not in the meantime to act on the suggestion of the Manager as to the erection of a new gasholder for additional storeage. A Committee was appointed to inquire and report as to some other improvements at the gas-works.

The Glasgow pig-iron market has been somewhat irregular this week; the prices of Scotch warrants fluctuating between 45s. 1d. per ton cash on Monday, and 43s. 11½d. on Thursday afternoon. The close yesterday was much stronger; buyers offering 44s. 4½d. per ton cash. The general position of the trade remains unaltered.

There is a continued improvement in the tone of the local coal market; partly owing to the prospect of an early opening of the Baltic shipping department. Prices are firm all round.

Fatal Accident at the Deptford Electric Light Station.—Shortly before noon last Tuesday, an explosion occurred at the works of the London Electric Light Supply Corporation, Limited, at Deptford, resulting in the immediate death of one man, and serious injuries to three others. A copper pipe communicating with one of the boilers was being used for the first time, when the 1500-horse power force proved too great for the strength of the pipe, which, although 19 inches in diameter, was only $\frac{3}{8}$ths of an inch thick. The result was an explosion, which alarmed the neighbourhood. The injured men were conveyed to the Seamen's Hospital, Greenwich, where one lies in a precarious state. Curiously enough, the Board of Trade Inspector (Major Marindin) was on the premises at the time of the accident. "This," says the *Electrical Review*, "is really a great misfortune to befall a Company just on the point of attempting to introduce electric lighting into London on a scale, and in a manner, hitherto scarcely dreamt of; and we sincerely regret its occurrence. The disaster is a curiously suggestive commentary upon the evidence of Sir W. Thomson on Monday last at the Board of Trade inquiry into the applications for Electric Lighting Orders and Licenses. In answer to a question put to him, Sir William said it was possible to imagine that a station might be wrecked, but with proper care this ought not to be taken into account for practical purposes."

CURRENT SALES OF GAS PRODUCTS.

Liverpool, *April* 13.

Sulphate of Ammonia.—The market has an improved tone, and parcels at Hull have readily found buyers at £11 17s. 6d., and at Leith at £11 15s. At the close higher prices are demanded; and as prompt parcels are far from plentiful, improved values are quite within range. The nitrate market has become very steady, and the rapid advance in sugar is pretty sure to stimulate the demand for sulphate; at all events, speculators will come in, in anticipation of heavier shipments of sulphate to the colonies, and the probable large increase of consumption in the beet-growing countries on account of larger sowings which will take place. It is reported that some Scotch contracts have been sold forward at £11 15s. per ton; but better prices should eventually be obtainable, if present prospects as regards the future are realized.

London, *April* 13.

Tar Products.—There has been no special feature in this market during the past week. Benzols continue firm at the prices named in the last report; and the same remark applies to tar oils and carbolic acid. Pitch is scarcely so firm; and anthracene is neglected. Prices: Tar, 20s. to 25s. per ton. Benzol (90 per cent.), 3s. per gallon; (50 per cent.), 2s. 2½d. per gallon. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha (30 per cent.), 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 2½d. per gallon. Pitch, 20s. to 25s. per ton, according to position. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 17s. per ton. Anthracene (30 per cent.), "A" quality, 1s. 4d. per unit; "B," 1s. 1d. to 1s. 2d. per unit, according to quality.

Ammonia Products.—The wretched weather and the lateness of the season, are undoubtedly interfering with the demand for sulphate, which usually sets in at this time of the year. Stocks, however, are low, and makers are somewhat indifferent about sales. The unexpected weakness in the nitrate market may possibly affect the price of sulphate; but the latter article is so much superior for agricultural purposes, that it is not likely users will change without a greater inducement than appears in the market price. Very little business is reported during the week, but that which has been done realized from £11 12s. 6d. to £11 17s. 6d. per ton, according to position. Prices: Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, from 3d. to 3½d. per lb. Muriate of ammonia, brown, £19 per ton; white, £23 15s. per ton. Sal-ammoniac, £30 to £32 per ton.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see *ante*, p. 710.)

Issue.	Share	When ex-Dividend.	Dividend or Int. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	18½–19½*	..	5 7 8
100,000	10	„	7½	Do. 7 p. c.	10	13–14*	+½	5 7 2
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110–112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24–26	..	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾–7¼	..	5 3 5
40,000	5	„	7½	Do. New	4	5¾–6¾	..	5 4 2
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	227–232	..	5 1 8
125,000	„	„	8½	Do. New	100	165–170	..	5 2 11
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	42–44	..	4 15 5
320,000	20	28 Mar.	11½	British	20	45–47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20–23	..	5 0 0
39,000	10	„	8	Do. 7 p. c.	10	13½–14½	..	5 10 4
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	14–15	..	5 6 8
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107–110	..	5 9 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	269–274*	+2½	5 0 4
180,000	„	„	10½	Do. New do.	100	214–219*	+2½	4 18 2
180,000	„	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	123–128	..	3 10 3
557,320	20	13 Dec.	13	Continental Union, Limited	20	47–49	..	5 6 2
242,680	20	„	13	Do. New '69 & '72	14	33½–33½	+½	5 8 5
200,000	20	„	10	Do. 7 p. c. Pref.	20	38–40	..	5 0 0
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204–208	..	4 16 2
234,060	10	30 Jan.	13	European, Limited	10	25½–26½	..	4 18 1
190,000	10	„	13	Do. New.	7½	17½–18½	+½	5 5 3
364,060	10	„	13	Do. do.	5	13½–13½	+½	4 16 3
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	261–265	..	4 17 9
100,000	„	„	4	Do. B, 4 p. c. max.	100	100–105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	260–265	..	3 15 6
80,000	„	„	5	Do. F, 5 p. c. Pref.	100	123–128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	180–185	..	4 1 1
1,800,000	„	„	7	Do. H, 7 p. c. max.	100	170–175	..	4 0 0
463,000	„	„	10	Do. J, 10 p. c. Pref.	100	258–263	..	3 16 1
1,061,150	„	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
294,850	„	„	4½	Do. 4½ p. c. do.	100	125–130	..	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	174–179	..	3 7 0
3,600,000	Stck.	14 Nov.	10	Imperial Continental	100	214–218	+4½	4 11 9
75,000	5	18 Dec.	6	Malta & Mediterranean, Ltd	5	5–5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	113–115	..	4 6 11
541,920	20	29 Nov.	6	Monte Video, Limited	20	18½–19½	..	6 3 1
150,000	5	29 Nov.	10	Oriental, Limited	5	9¼–9½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6¼–6½	..	5 3 8
166,870	10	16 Jan.	4	Pará, Limited	10	5½–6	..	6 13 4
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104–107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	95–100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	16½–17½	..	5 14 4
500,000	Stck.	28 Feb.	16½	South Metropolitan, A Stock	100	315–320	+1	5 1 7
1,350,000	„	„	12½	Do. B do.	100	243–248	+2	4 17 9
141,500	„	„	13½	Do. C do.	100	255–265	..	5 0 0
600,000	„	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137–140	..	3 11 5
60,000	5	28 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11–13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	257–262	..	3 8 8
1,730,560	Stck.	11 Apr.	7½	East London, Ordinary	100	205–209*	–½	3 11 9
700,000	50	13 Dec.	9	Grand Junction	50	122–126	..	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272–277	..	3 15 9
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	251–256	–1½	3 10 3
406,200	100	„	7½	Do. 7½ p. c. max.	100	199–204	..	3 13 6
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118–120	..	3 6 8
500,000	100	14 Feb.	12½	New River, New Shares	100	350–355	..	3 8 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	125–128	..	3 2 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	173–177	+2	3 7 10
126,500	100	„	6	Do. 7½ p. c. do.	100	161–166	+1	3 12 3
1,155,066	Stck.	„	10	West Middlesex	100	264–269	..	3 14 4

*Ex div

PONTEFRACT WATER SUPPLY.—The Corporation of Pontefract have decided to commence works of water supply from Rouse. The length of the main will be about ten miles, and the lift 300 feet. The works are designed to supply 500,000 gallons of water in ten hours. Mr. G. Hodson, M. Inst. C.E., is the Engineer.

BIRMINGHAM DEMOCRATS ON THE SALTLEY INQUIRY.—At a meeting of the Birmingham Social Democratic Federation last Sunday week, resolutions were passed condemning the report of the recent inquiry as "altogether contrary to the weight of evidence adduced," declaring the members of the Town Council who voted for its adoption, and the Engineer in charge of the works, "responsible for the scandalous number of hours that many of the *employés* are compelled to work," and calling upon the Council to immediately reduce the working week to forty-eight hours, without reducing the weekly wages. The meeting also passed a resolution declaring the Council "guilty of a breach of trust in increasing the salary of Mr. Hack from £900 to £1050 a year" under the circumstances named in the preceding resolutions.

MOSSLEY CORPORATION GAS SUPPLY.—The Mossley Gas Committee resolved at their last meeting that the sum of £179 13s. 1d. should be transferred from the gas revenue account to district fund account. This transfer is made under the "sliding scale" clause of the local Gas Act; the amount mentioned being one-third of the difference between the price actually charged for gas during the last year and the "standard price" authorized by the Act. At the meeting of the Town Council last Thursday, the Mayor (Alderman Buckley) gave some figures with reference to the last year's working. In the year ending March, 1888, the gas made was 72,672,000 cubic feet; in 1889, it was 76,705,000 feet—or an increase of 4,033,000 feet. There was sent out up to March, 1888, 72,431,000 cubic feet; and in 1889, 76,630,000 feet—or an increase of 4,199,000 feet. The gas sold in 1888, was 62,204,800 cubic feet; in 1889, 65,714,800 cubic feet, or an increase of 3,510,000 feet—thus leaving gas unaccounted for in 1888, 10,222,200 feet; 1889, 10,915,700 feet; or in 1888 a percentage of 14·11 of leakage, and in 1889, 14·24 per cent. He was afraid that this leakage was in the services throughout the district, especially in Saddleworth. The Gas Manager (Mr. R. Merrell) would, no doubt, direct his attention to this point, and see that the leakage was reduced.

DEVONPORT WATER BILL.—This Bill came before a Committee of the House of Lords, presided over by Lord Henley, on Tuesday, the 2nd inst. The promoters were represented by Mr. Stephens, Q.C., and Mr. Fitzgerald; and the Plymouth Corporation, who appeared in opposition, by Mr. Balfour Browne and Mr. Freeman. The object of the Bill was (1) to change the name of the Company from the Plymouth Dock (Devonport) Water Company into the Devonport Water Company; (2) to provide for the enlargement of their reservoirs; (3) to obtain the necessary land for enlargement. In the course of the evidence on behalf of the promoters, Mr. P. Francis, the Engineer of the Company, said the capacity of their present reservoir was about 20 million gallons; and the daily supply for consumption was 2 million gallons. They proposed to increase the storeage by 25 million gallons. The demand was increasing; and they simply wanted to enlarge the existing reservoirs. The Bill would not interfere with the works of the Plymouth Corporation; and the powers sought for would enable the Company to fulfil their obligations, and to supply all their customers and the forts at St. Budeaux. He calculated the population that they supplied in the district of Devonport and Stonehouse at 60,000; and it was increasing at the rate of 3 per cent. Mr. Balfour Browne objected to the proposal of the Company to take Tamerton and St. Budeaux out of the limits of the Plymouth district, or, at all events, to give the Devonport Company concurrent rights. The Corporation went to Parliament before the Devonport Company, and obtained powers under their Act of 1887. They were at that time constructing a most important system of water supply, and were prepared to supply larger quantities of water than the Devonport Company. Ultimately the Committee resolved that the Bill could proceed with the exception of the clause which provided for the extension of the powers of the Company to levy and recover rates in relation to a supply of water within the parishes of Pennycross, St. Budeaux, and Tamerton.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

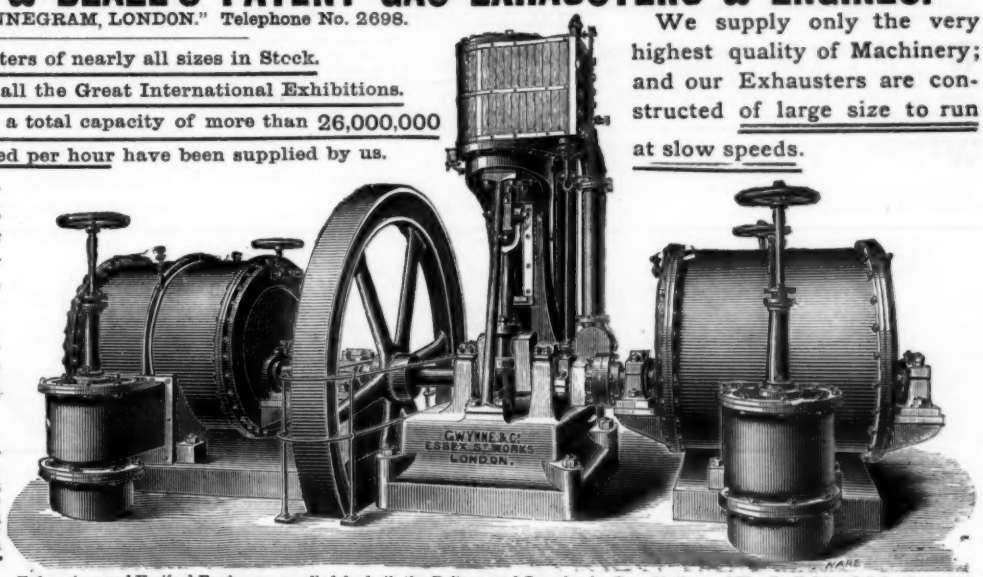
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved COTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / No. 54, BERNARD STREET, LEITH, } SCOTLAND.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street LONDON.

SHIPPING AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 9, Crosby Square, London, E.C., Shipping Agent to several Foreign Gas Companies, is prepared to attend to the Forwarding and Insurance of Goods for Foreign and Colonial Gas Companies, &c., and Gas Plant Manufacturers.
For Rates of Freight, apply as above.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO., 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.
*** See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 743 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award. Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

FORCED DRAUGHT.

MELDRUM BROS., Engineers, of 26, Half Street, Cathedral Yard, Manchester, are prepared to Supply and Fix to any ordinary Boiler Furnace complete APPARATUS for burning Breeze, Coal Dust, or other small or poor Fuel. Results guaranteed. Terms on application.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
*** See large Advertisement in last week's issue, page 652.

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.
Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

THE Engineer of a large Provincial Gas Company will have a VACANCY in May for a Pupil. Premium required.
Address No. 1692, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a re-engagement as Fitter in Gas-Works. Well up in the Fixing of Cooking and Heating Stoves, and in Lighting Work. Meter Fixing and Reading, Main and Service Laying, and House Fitting. Good references.
Address, FITTER, 169, Elderfield Road, Clapton Park, LONDON, N.E.

WANTED, by a Coal Factor, Travellers for Southern and Eastern Counties. Must have connection with Gas Companies. State if know any other ground in addition.
Apply, by letter only, to No. 1694, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a provincial Gas Company, a GAS-FITTER well up in all branches. Good references indispensable.
Apply, stating age and qualifications, to No. 1696, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the temporary assistance of a DRAUGHTSMAN thoroughly conversant with all kinds of Gas Apparatus. Salary £2 2s. per week.
Address No. 1698, care Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at a Country Gas-Works, about 20 miles from London, and in an increasing neighbourhood, manufacturing about 15 millions per annum, a MANAGER who understands Gas Manufacture by latest improvements, including sulphate ammonia, keeping the Accounts at the Works, and assisting the Secretary in outdoor duties. Good character indispensable.
Address No. 1697, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED—Any Gas Company having for Sale one LIVESEY WASHER, and one KIRKHAM'S SCRUBBER for 500,000 feet per day, will please communicate with Mr. LONGWORTH, Gas Offices, GUILDFORD.

WANTED, a large Second-hand Gas PURIFIER, for use in connection with Sulphur-Recovery Process.
Apply, by letter only, to No. 1688, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WASHER.

WANTED, a Small Washer (Second-hand) for Works carbonizing about 100 tons of Coal per annum.
Address C. W. GRIMWOOD, Sudbury, SUFFOLK.

WANTED, back Volumes of the "JOURNAL OF GAS LIGHTING," bound or unbound. State price and particulars.
Address No. 1699, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—By the Clayton, Allerton, and Thornton Gas Company, Two 12-inch ANDERSON'S PATENT CONCENTRIC STATION GOVERNORS, in good working condition. Being taken out to replace them with larger Governors. One is taken out, and the other will be at liberty in June. No reasonable offer refused.
Apply to the undersigned.
JOHN NIVEN,
Engineer and Manager.
Clayton, near Bradford,
April 3, 1889.

FOR SALE—A pair of Exhausters with Hydraulic Bye-Pass; at present working upon the Bingley Gas-Works. Capacity of each Exhauster 12,000 cubic feet per hour.
The above-mentioned Exhausters will be ready for disposal next June, when they will be superseded by others of greater capacity.
Tenders for the purchase of the same to be addressed to the Chairman of the Gas Committee.
By order,
GEORGE DUNBAR MALAM,
Engineer.
Bingley, March 19, 1889.

CORPORATION OF LONGTON.

GASHOLDER, ETC., FOR SALE.

THE Gas Committee have the following Plant FOR SALE (in good condition), and are prepared to receive OFFERS for the same:—
GASHOLDER 60 feet diameter, and 23 feet deep, and Framework.
CAST-IRON VERTICAL CONDENSER, suitable for a daily make of 250,000 to 300,000 cubic feet.
For further particulars and to view, apply to the undersigned.
W. W. HULSE,
Secretary and Manager.
Gas-Works, Longton, Staffordshire,
April 6, 1889.

FOR SALE—Two Purifiers, 12 ft. by 6 ft. by 3 ft. 6 in. deep (inside measurement). Complete with Covers, three tiers of Bars and Sieves for each, two 8-inch Four-way Cocks and Centre Pipes; also STATION METER (by J. Milne and Son) to pass 6000 cubic feet per hour, with Bye-Pass arrangement.
JESSE WALL,
Manager and Secretary.
Gas-Works, St. Andrews, N.B.,
April, 1889.

TO COLLIERY PROPRIETORS.

THE Gas Committee of the Keighley Corporation are prepared to receive TENDERS for the supply of 17,000 tons of first-class GAS COAL during the next Twelve months; the Coal to be delivered on their Sidings at Keighley.
Forms of tender can be obtained from the undersigned.
JOHN LAYCOCK,
Engineer and Manager.
Gas Offices, Keighley, April 11, 1889.

TO COAL MERCHANTS, SHIP-OWNERS, AND OTHERS.

THE Directors of the Torquay Gas Company are prepared to receive TENDERS for the supply for One, Two, or Three years of about 10,000 tons per year (or such other quantity as may be agreed on) of approved GAS COALS.
For particulars apply to Mr. Beynon, the Manager of the Company, Hollacombe, Paignton.
Tenders to be sent to the undersigned on or before the 24th day of April inst.
By order,
J. KITSON, Secretary.
Torquay, April 8, 1889.

LURGAN GAS, LIGHT, & CHEMICAL COMPANY, LIMITED.

COAL WANTED.

THE Directors are anxious to procure TENDERS for the supply of 2500 tons of best (screened) GAS COAL, delivered into Lighters *ex* Ship at Belfast, free of all charges. Delivery of 2000 tons will be taken before the 1st of November; the remainder to be delivered at such times before the 1st of March next as may be required. Vessels carrying from 250 to 350 tons can at once deliver into Lighters; and these Lighters be back for a further cargo within a period to be arranged.
Tenders (in sealed envelope), accompanied by reference to Gas-Works using the Coal offered, should reach me not later than Eleven o'clock in the Forenoon of Monday, the 6th of May next.
FRED. W. MAGAHAN, Secretary.
Gas-Works, Lurgan, April 12, 1889.

C. & W. Walker,

Gasholders, — Purifiers, Purifying Machines.

C. O2 & Tar extracting Washers, — Scrubbers, Sulphate and Sulphur Plants.

Retort Mouthpieces, Condensers, Lifting apparatus, Centre and Four way Valves, — Slide valves, &c., &c., Wood Sieves and Tar Burners.

Addresses:— 8. Finsbury Circus, London.
Midland Works, Donnington, Salop.
Telegraphic Address.—Fortress London, or Fortress Donnington.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Directors of the Wellington (Salop) Coal and Gaslight Company invite TENDERS for the purchase of the surplus TAR to be produced at their Works for One year, from the 1st of June next.

Particulars may be obtained from the undersigned, to whom tenders should be sent on or before May 10.

JNO. C. BELTON, Manager.

Wellington, Salop, April 12, 1889.

BOROUGH OF HEYWOOD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Heywood Corporation are prepared to receive TENDERS for the supply of 8000 to 10,000 tons of best screened GAS COAL, to be delivered at Broadfield Railway Station, Heywood.

The deliveries are to be made in such quantities and at such times as the Gas Engineer may direct.

Full particulars and tender form can be had on application to the Engineer, Mr. H. Hawkins.

Sealed tenders, endorsed "Tender for Coal," are to be sent to the undersigned not later than Wednesday, the 24th of April inst. By order,

A. WALLIS, Town Clerk.

April 12, 1889.

CORPORATION OF LEICESTER.

COAL TENDERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of COALS, COBBLES, or NUTS (about 95,000 tons per annum), for One, Two, or Three years, ending May 31.

Particulars and form of tender can be obtained on application to the Engineer.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Gas Coal," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, May 11 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
April 11, 1889.

BELPER GAS AND COKE COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive OFFERS for the LIQUOR and TAR for One year, from the 8th of May, 1889.

The Company possess their own Tar-Tank (8 tons); and the usual charge will be made for the use of the same.

The highest or any tender not necessarily accepted.

Tenders to be sent to me not later than the 7th of May.

Payments required the first of the month following invoice.

JOSEPH PYM,
Managing-Director.

Belper, April 10, 1889.

BELPER GAS AND COKE COMPANY.

TENDERS FOR COAL AND COKE.

THE Directors are prepared to receive TENDERS for the supply at their Works, situate near the Railway Station, Belper, of 1500 tons more or less of GAS COAL (part in the Gas Company's own wagons); also about 150 tons more or less of CANNEL COAL, to be delivered at such times and in such quantities as the Directors or their authorized servants shall from time to time order.

Sealed tenders, stating price per ton of 21 cwt., and information as to the quality and quantity of Gas the Coal is estimated to produce, also as to where the same is now in use, to be sent to the undersigned, on or before Friday, the 10th of May.

The Directors do not bind themselves to accept the lowest or any tender, nor to take the whole of the above quantities of Coal or Cannel.

By order,
JOSEPH PYM,
Managing-Director.

Belper, April 10, 1889.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(GAS DEPARTMENT.)

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Sutton-in-Ashfield Local Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the ensuing year.

Particulars may be obtained on application to the Manager, at the Gas-Works, Sutton-in-Ashfield, Notts.

Tenders, stating price per ton of 20 cwt. at the Works, to be addressed to "The Clerk to the Local Board, Local Board Offices, Sutton-in-Ashfield," and marked "Tender for Tar and Liquor," so as to arrive not later than Tuesday, the 30th of April, 1889.

By order,
G. H. HIBBERT,
Clerk to the Committee.

Local Board Office, Sutton-in-Ashfield, Notts.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(GAS DEPARTMENT.)

SUPPLY OF GAS COAL.

THE Gas Committee of the above Local Board are prepared to receive TENDERS for the supply of 2200 tons of well-screened GAS COAL and 250 tons of CANNEL, to be free from Shale and Pyrites, and to be delivered at the Railway Station, Sutton, in such quantities as the Manager shall from time to time direct, between July 1, 1889, and June 30, 1890.

Particulars may be obtained on application to the Manager, at the Gas-Works, Sutton-in-Ashfield, Notts.

Tenders, stating price, to be addressed as above, and marked "Tender for Coal," so as to arrive not later than Tuesday, the 30th of April, 1889.

By order,
G. H. HIBBERT,
Clerk to the Committee.

Local Board Offices, Sutton-in-Ashfield, Notts.

TENDERS FOR GAS COALS.

THE Directors of the Burgess Hill Gas Company, Limited, invite TENDERS for the supply of 750 tons (colliery weight) of THORNCLIFFE SILKSTONE, PELAW MAIN, WALLSEND, OR OTHER GAS COALS of equal quality, to be delivered free to Burgess Hill Station—300 tons during the month of May next; and 350 tons during the month of September next.

Tenders to be sent to the undersigned on or before the 24th inst.

The Directors do not bind themselves to accept the lowest or any tender.

SIMEON NORMAN, Secretary.

Burgess Hill, April 13, 1889.

COUNTY BOROUGH OF SALFORD.

THE Gas Committee are prepared to receive TENDERS for the supply of the RETORT-FITTINGS required for Retorts at the Regent Road Works.

The plans and specifications may be seen, and all particulars obtained, on application to the Engineer, Gas Offices, Salford.

Sealed tenders, endorsed "Tenders for Retort Fittings," addressed to the Chairman of the Gas Committee, must be delivered at my Office before Five p.m. on Thursday, the 2nd of May, 1889.

By order,
SAML. BROWN, Town Clerk.

Town Hall, Salford, April 13, 1889.

TENDERS FOR COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 500 to 800 tons of best screened GAS COAL, at per ton of 21 cwt., to be delivered free at Droitwich (G.W.) Railway Station, or, if by Water, on the Wharf at the Droitwich Gas-Works, at such times and in such quantities as may be required.

The contract will be for one year, commencing on the 1st prox.

Tenders (with analysis of Coal proposed to be supplied), properly endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 30th inst.

The Corporation do not bind themselves to accept the lowest or any tender.

S. JOHN TOMBS, Town Clerk.

Droitwich, April 8, 1889.

BUXTON LOCAL BOARD.

THE Buxton Local Board invite Tenders for the purchase of the surplus TAR and LIQUOR produced at their Works in Ashwood Dale for One, Two, or Three years, commencing from the 30th of June next.

Further particulars and forms of tender to be obtained of Mr. G. Smedley, Gas Office, Buxton.

Tenders, endorsed "Tender for Tar and Liquor," to be addressed to the Chairman of the Gas Committee, and delivered not later than Noon on the 24th inst.

The Board do not bind themselves to accept the highest or any tender.

By order,
JOSIAH TAYLOR, Clerk.

BUXTON LOCAL BOARD.

THE Gas Committee invite Tenders for the supply of good GAS COAL for One or more years, at the rate of about 2500 tons per annum, to be delivered at their Siding (on the Midland Railway) in Ashwood Dale, Buxton.

Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at the Local Board Offices, in George Street, not later than Noon on the 24th inst.

Forms of tender and other particulars may be obtained of Mr. G. Smedley, Engineer, Gas Office, Bridge Street, Buxton.

The Board do not bind themselves to accept the lowest or any tender.

By order,
JOSIAH TAYLOR, Clerk.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Local Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One year, from the 1st day of July, 1889, or for such longer term as may be contracted for with consent of the Board. The Tar and Liquor will be delivered free in Contractor's boat on the Bridgwater Canal.

Tenders to be sent in to the undersigned on or before the 2nd day of May, 1889, endorsed "Tar."

The purchaser will have to enter into a contract, form of which can be seen at the Board Office, any Tuesday or Friday, between the hours of Ten and Twelve a.m. and Two and Five p.m.

The Board do not bind themselves to accept the highest or any tender.

Further particulars to be had of Mr. A. Graham, Gas-Works Manager.

W. MULLARD,
Clerk to the Local Board.

Lymm, near Warrington, April 9, 1889.

COAL AND CANNEL.

THE Lymm Local Board are prepared to receive TENDERS for the supply of COAL and CANNEL, to be delivered at their Gas-Works in Lymm, for a term of One year from the 1st day of July, 1889. The probable quantities required are about 900 tons of Coal and 150 tons of Cannel; but the Board reserve the right of increasing or decreasing the quantities named.

The person whose tender is accepted will be required to enter into a contract, form of which can be seen at the Board Office any Tuesday or Friday, between the hours of Ten and Twelve a.m. and Two and Five p.m.

The tenders, stating price per ton delivered alongside the Works, to be sent to the undersigned on or before the 2nd day of May next, and endorsed "Coal and Cannel."

Further particulars can be had of Mr. A. Graham, Gas-Works Manager.

The Board do not bind themselves to accept the lowest or any tender.

W. MULLARD,
Clerk to the Local Board.

Lymm, near Warrington, April 9, 1889.

CONTRACT FOR COAL AND LIME.

THE Inverness Gas Commissioners are prepared to receive OFFERS for 4000 tons of GAS COAL, to be delivered during the next Twelve months, at such times and in such quantities as may be required. Intending offerers to state their price delivered free at Inverness Station or Harbour.

The Commissioners will also receive OFFERS for 200 tons of SHELL LIME delivered free at Inverness Station or Harbour, during the next Twelve months, as may be required.

Tenders, endorsed "Tenders for Coal or Lime," and addressed to the Chairman of Commissioners, will be received up to Monday, May 6, 1889.

Gas and Water Office, Inverness,
April 13, 1889.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the AMMONIACAL LIQUOR that may be produced at their Gas-Works, York Street, Meadow Lane, and New Wortley, during a period of One, Two, or Three years, from the 1st of July next.

The quantity annually produced is approximately about One million gallons at York Street Works, about 2½ million gallons at Meadow Lane Works, and about 3 million gallons at New Wortley Works.

Tenders may be for the Liquor produced at any one of the Works, or for the whole.

Forms of tender and conditions of contract may be obtained on application to Mr. Lupton, Gas Department, Municipal Offices, Leeds, and endorsed Tenders, addressed to the Chairman of the Gas Committee, at the same Address, will be received not later than Thursday, the 9th day of May next.

The Committee do not bind themselves to accept the highest or any tender.

TENDERS FOR COALS.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the supply of 36,000 tons of screened SOFT COALS and SOFT COBBLES or NUTS, to be divided into Four Contracts of 9000 tons each; and to be delivered guaranteed weight 21 cwt. to the ton.

Sealed tenders (to be made on forms obtainable at the Company's Office), specifying the description of Coals and the Pits at which they are to be raised, stating the quantities and prices delivered at the Midland or Great Northern Railway Stations, or at the Gas Company's Siding, Midland Railway, London Road—if sent by Canal to be delivered at some Wharf in the Borough of Derby, or at the Gas Company's Wharf, London Road—in manner and subject to the conditions to be made, must be delivered at the Offices of the Company, Friar Gate, on or before Tuesday, the 23rd day of April inst.

By order of the Directors,
RICHARD FISHER, Secretary.

Derby Gas Office, April 3, 1889.

MILFORD IMPROVEMENT ACT, 1857.

CONTRACT FOR NEW GAS-WORKS.

THE Milford Improvement Commissioners (Milford Haven) invite TENDERS for the supplying and fixing of all the necessary GAS-MAKING APPARATUS for their proposed New Gas-Works at Milford Haven (capacity, daily make 50,000 cubic feet).

Plans may be seen at the Commissioners' Offices, Charles Street, Milford Haven.

Printed specification and form of tender may be had for seven shillings and sixpence, on application to the undersigned, from whom full information may be obtained.

The Improvement Commissioners do not bind themselves to accept the lowest or any tender.

Tenders, endorsed "Contract No. 2," addressed to the Chairman of the Improvement Commissioners, Milford Haven, must be sent in on or before the 1st day of May next.

PEREGRINE THOMAS,
Clerk to the Milford Improvement Commissioners.

Milford Haven, April 5, 1889.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 50,000 tons of best DOUBLE-SCREENED LARGE GAS COALS, the deliveries to commence in July next, for a period of One year, and to be supplied in monthly quantities in accordance with the Specification.

A quantity of about 8000 tons will be required at the Bute Terrace Works, and about 42,000 tons at the Grangetown Works, Cardiff.

Parties tendering can do so for the whole quantity, or for quantities from 5000 tons upwards.

The Company's Grangetown Works are in direct communication with all Railway Companies and with the Penarth Docks, and well situated for receiving cargoes of Coal by steamers.

Deliveries, if by steamer, to be free into trucks at Penarth Docks, and if by rail, free into the Works at Grangetown; those for the Bute Terrace Works to be delivered at the Cardiff Station of the Great Western, Taff Vale, or Rhymney Railway.

Specification of monthly deliveries, conditions of discharging, and all other information required, can be obtained on application to Mr. H. Morley, the Company's Engineer.

The tenders must state the name and locality of the Colliery, also the particular seam from which it is proposed to supply the coal, and the price, delivered as above, accompanied if possible with a practical working analysis.

Sealed tenders to be sent to the undersigned not later than Wednesday, the 1st of May next, addressed to the Chairman of the Company, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
GEORGE CLARRY, Secretary.

Gas Offices, Cardiff, March 30, 1889.

Cheap Gas for Consumers and Co-operation with existing Gas Companies.

(See opinions of Gas Experts—Professor Wanklyn and Mr. Charles Gandon.)

The Subscription List will close for Town and Country on or before 4 p.m. on Tuesday, April 16.

Water Gas manufactured under Stapp's Patent Process is an ILLUMINATING GAS, and is actually in use for Street and Private Lighting in the following American Towns:—

CHICAGO—KANSAS CITY—GEORGETOWN—LEADVILLE—and DENVER (Colorado).

THIS PROCESS CAN BE APPLIED TO EXISTING GAS-WORKS AND GAS-FITTINGS.

STAPP'S WATER GAS PATENTS

LIMITED.

(Incorporated under the Companies' Acts, 1862 to 1888.)

CAPITAL £150,000, in 150,000 Shares of £1 each.

Payable 2s. on Application; 8s. on Allotment; and the balance as may be required.

Directors.

WARINE B. M. LYSLEY, Esq. (Director Bombay Gas Company, Limited).
W. J. FRASER, Esq., Assoc. M. Inst. C.E., Commercial Road East.
THOS. S. BORRADAILE, Esq., 16, St. Helen's Place, London, E.C.
W. FLETCHER GORDON, Esq. (Director Bombay Gas Company, Limited).
*R. HENDERSON, Esq., C.E., F.G.S., 8, Drapers' Gardens, E.C.
With power to add two additional Directors.
* The Vendor will join the Board after allotment.

Consulting Chemist.

PROFESSOR WANKLYN, 7, Westminster Chambers, Victoria Street, S.W.

Bankers.

Messrs. MARTIN & Co., 68, Lombard Street, London, E.C.

Brokers.

Messrs. GURLITT & MANDELKAU, 5, Angel Court, E.C.; and Stock Exchange, London, E.C.

Solicitors.

Messrs. THOMAS & HICK, 18, Walbrook, London, E.C.

Auditors.

Messrs. FREDK. B. SMART & Co., 22, Queen Street, London, E.C., Chartered Accountants.

Patent Agent.

H. GARDNER, Esq., 166, Fleet Street, London, E.C.

Secretary and Offices (*pro tem.*).

Mr. D. H. THOMPSON, 120, Cannon Street, E.C.

STAPP'S WATER GAS PATENTS, Limited.

REPORT of Professor WANKLYN,

(Professor of Chemistry and Author of "The Gas Engineer's Chemical Manual.")

THE LABORATORY, 7, WESTMINSTER CHAMBERS, S.W.

To the Directors of STAPP'S WATER GAS PATENTS, LIMITED.

GENTLEMEN,—Having been consulted by you respecting these Patents and Stapp's method of manufacturing Water Gas, I beg to report in favour of this process, and to certify that, in my opinion, Stapp's Patent Furnace and arrangement **provides the best means** for the proper and economical production of Water Gas; and, further, that Water Gas will always have the advantage in competition with Coal Gas.

The Capital embarked in Gas-Works in the United Kingdom is about equal to the Government income—that is to say, the amount raised by a year's taxation, which is about 80 millions sterling. It is not proposed to supersede the Gas Industry, or to compete with it, but to supplement it.

The best way to deal with ordinary coal is to carbonize it, and get 10,000 cubic feet of Coal Gas and 14 cwt. of Coke and Tar and Ammonia from the ton of coal as is done in the Gas-Works. After that has been accomplished, then comes the opportunity for Water Gas.

In many Gas-Works—in most Gas-Works—the Coke is a drug at some period in the year, and Gas Coke does not command what it ought to sell for.

Gas-Works ought to be provided with a supplementary plant to use up the Coke for making Water Gas. The Ammonia would be doubled, and Gas Tar, which, under existing conditions, has undergone shameful depreciation, could be to some extent employed for the enrichment of the Water Gas.

J. ALFRED WANKLYN.

April 12, 1889.

Opinions of Mr. CHARLES GANDON.

The Directors have submitted this Patent Process, with Professor WANKLYN'S Report, to one of the most practical Gas Engineers, Mr. CHARLES GANDON, of the CRYSTAL PALACE DISTRICT GAS COMPANY, LIMITED; and he has expressed a FAVOURABLE OPINION as to the merits of the Invention, which is peculiarly adapted for Foreign Countries and Abroad, where Coal is dear.

REPORT OF SIR DOUGLAS FOX, C.E.

28, Victoria Street, Westminster, March 28, 1889.

To the BRITISH WATER GAS SYNDICATE, Limited.

Gentlemen,—I have carefully examined the process of Water Gas as carried out at the works of the Leeds Forge Company, Limited, and herewith enclose my report thereon. I have, from the experiments made on my behalf, come to the conclusion that Water Gas has a great future for manufacturing, heating, and lighting purposes, and that it can be produced at a cost, at present prices, of about 4d. per 1000 cubic feet. It must, under many conditions, prove a formidable rival to ordinary Coal Gas.

Yours faithfully, DOUGLAS FOX.

An order to inspect the Plant in work at the Leeds Forge Company may be had on application to the Secretary.

Water Gas proved a commercial success (See report enclosed, with prospectus). A saving of £10,000 per annum in one Yorkshire works alone.

THE YORKSHIRE WATER GAS COMPANY

LIMITED.

(Incorporated under the Companies' Acts, 1862 to 1887.)

CAPITAL £151,000, in 30,000 SHARES of £5 each.

Payable 10s. on Application; £1 10s. on Allotment; £1 in one month after Allotment; and the Balance two months after Allotment.

And 200 Founders' Shares of £5 each, each of which Founders' Shares is entitled to receive one-half of all profits in any one year after 10 per cent. has been paid on the ordinary shares.

Directors.

Rear-Admiral JOHN BYTHESEA, C.B., V.C., 22, Ashburn Place, London, S.W., Chairman.
JAMES G. BELLAMY, Esq., The Grange, Goldhawk Road, London, W. (Director of the British Water Gas Syndicate, Limited).
ALFRED DAVY, Esq., Consulting Engineer (late of the firm of Messrs. Davy Bros., Park Iron-Works, Sheffield).
H. HERBERT ANDREW, Esq. (Member of the Iron and Steel Institute, of Messrs. J. H. Andrew & Co., Steel Manufacturers, Sheffield, and Director of J. E. H. Andrew & Co., Limited).
ALFRED S. KIRK, Esq., Greenwood Leghe, Ingleton, Yorkshire (Director of the Leeds Forge Company, Limited, and of the British Water Gas Syndicate, Limited).

CONSULTING ENGINEER.—E. A. COWPER, Esq., 6, Great George Street, Westminster.

Bankers.

Messrs. BROWN, JANSON & CO., 33, Abchurch Lane, London, E.C. | Messrs. WILLIAM WILLIAMS, BROWN, CO., Leeds.

Brokers.

LONDON: Messrs. J. G. HYDE & SON, 2, Tokenhouse Buildings, E.C., and Stock Exchange.
LEEDS: Messrs. JOHN REDMAYNE & CO., 79, Albion Street, and Stock Exchange, Leeds.
LIVERPOOL: Messrs. HENRY E. RENSBURG & CO., Imperial Buildings, 5, Dale Street, Liverpool, and Stock Exchange.
GLASGOW: Messrs. HART & WATSON, 63, St. Vincent Street, and Stock Exchange, Glasgow.
DUNDEE: Messrs. ANDREW OGILVIE & CO., 1, Royal Exchange Buildings, and Stock Exchange, Dundee.
BRISTOL: Messrs. BETTON, SAYCE, VAUGHAN, & CO., 2, Clare Street, Bristol.
BATH: Messrs. BETTON, SAYCE, VAUGHAN, & CO., 12, Old Bond Street, Bath.

Solicitors.

Messrs. CHINERY, ALDRIDGE, & CO., 2, Brabant Court, Gracechurch Street, E.C. | Messrs. T. & H. GREENWOOD TEALE, 86, Trinity Street, Leeds.

Auditors.

Messrs. J. F. LOVERING & CO., Chartered Accountants, Gresham Street, London, E.C. | Mr. JOHN GORDON, JUN., Chartered Accountant, 1, Bond Street, Leeds.

Secretary.

Mr. EDWARD G. LAWRANCE.

London Offices.
86, Walbrook, London, E.C.

Head Office.
Commercial Buildings, Park Row, Leeds.

ABRIDGED PROSPECTUS.

THE object of this Company is to secure licenses to work in Yorkshire the well-known water gas patents for improvements in the manufacture of gas for illuminating, heating, welding, and all metallurgical purposes, subject only to the reservations contained in the contract of purchase hereinafter referred to, lately owned by the Europaischen Wasser Gas Actien Gesellschaft in Essen, for the United Kingdom of Great Britain and Ireland, and numbered 2249, dated 9th June, 1877; 173, dated 14th January, 1878; 5310, dated 23th December, 1879; 4907, dated 9th November, 1881; 5965 dated 14th December, 1882; 6857, dated 9th June, 1884 15,706, dated 21st December, 1885; 15,707, dated also 21st December, 1885; and the Fahnejelm Magnesia Comb Patents, numbered 5646, and dated 5th day of December, 1883; and No. 7573, dated 22nd June, 1885, and Wilson and Dawson's Patents, numbered 3949, dated 12th October, 1876; 1699, dated 8th April, 1882; 4697, dated 3rd October, 1882; 5980, 15th May, 1885; 6663, 6th March, 1886; 6514, 2nd May, 1888; together with such rights as the British Water Gas Syndicate are possessed of to use the inventions of the well-known Gas Engineer, Mr. A. Wilson, of Stafford, and also the patent rights of Mr. Bernard Dawson, C.E., of 110, Cannon Street, London, in connection with such inventions, as limited by the purchase agreement, which will place this Company in a commanding position in respect to water gas plant, and also enable them to supply in the county of York the most improved type of gas generator and furnace plant.

Hitherto all attempts in this country to manufacture and apply water gas on a commercial scale for heating, smelting, and illuminating purposes by simple and economical means, and without the use of skilled labour, have failed; but, after application and use upon a large scale, these inventions have proved beyond all doubt that pure water gas when used as an illuminating medium in combination with the Fahnejelm Magnesia Comb, the Yorkshire rights of which are secured to this Company, gives a light in every way superior to coal gas, and yet having all its convenience of application, and rivalling in brilliancy the electric light, can be manufactured at under 4d. per 1000 cubic feet, after allowing for cost of production, wages, wear and tear of plant, and all contingencies.

The greater heating power of this gas, as compared with any produced by present known means upon a commercial scale, gives a mode of application to the industries of steel manufacture, &c., and is of the greatest possible value in its power to produce economical results over the present systems, and it is also for the purpose of developing and extending these various uses in Yorkshire that this Company is formed. The European patents have been secured in influential hands, and their application has been attended with the greatest success. The first plant in this country has been erected by Mr. Samson Fox, M. Inst. C.E., J.P., at the Leeds Forge, and has revolutionized the previous means of working mild steel, the production of steam, and the illumination of the works. Hitherto those works were supplied with ordinary coal gas by the Leeds Corporation at the cost of 1s. 10d. per 1000 cubic feet, which was almost the lowest price charged by any gas company in the United Kingdom, yet by the adoption of water gas the power of rapid production of finished material is greatly increased; and taking all advantages into consideration, a saving has been effected of over £10,000 in the first year of its use.

Water Gas has already been extensively adopted in many of the large manufacturing towns in Germany with eminently satisfactory results. Among others may be cited:

Essen—At the works of Herrn Schulz Knaudt and Company, for welding, and lighting private houses, and street lamps, and gas-engine driving, calcining magnesia, &c. Hoerde—The Hoerde Mines and Iron-Works Company, for open-hearth and crucible steel melting, re-heating furnaces, lighting, and heating. Witkowitz, Austria—Baron Rothschild's Iron and Steel Works, for open-hearth steel melting, lighting, and heating, and for gas-engine driving. The town is lighted with water gas, including the church, streets, and hotels. Gandersdorf, near Vienna—For lighting, heating, and brazing. Furstenwalde—At the works of Herr Julius Pintsch, for welding buoys, &c., brazing, lighting, and heating. Geinhausen—For glass-blowing, for electric incandescent lamps, where it has been adopted principally on account of the great purity and clearness of the flame—a necessity where great clearness of material is required. Konigszelt—For lighting and heating a large railway station, and switch lamps—700 flames. Frankfurt—The Frankfurt Metal Company, for smelting and refining precious metals. Warstein—For illuminating a large stalactite and stalagmite cavern belonging to the town of Warstein, where water gas has been preferred to coal gas, and electric lighting. Hameln on the Weser, at Dr. Lohmann's Chemical Works. Winterthur, in Switzerland, at the works of Gebruder Sulzer, for welding, lighting, and heating purposes; and in other important manufacturing towns in France, Italy, Russia, and America.

In England it has been in use not only at the works of the Leeds Forge Company, but for many months at the works of Mr. Alfred Wilson, at Stafford, where it is exclusively employed in his private house for lighting, heating, and cooking, and for any purpose to which solid fuel and coal gas has hitherto been applied.

Applications have already been received from a large number of the most important manufacturers in Yorkshire, who are anxious to adopt water gas in their manufactories, not only for illuminating purposes, but also for motive power, smelting, and metallurgical purposes, and arrangements are in progress to grant licenses.

Mr. A. Wilson has for many years been recognised as one of the first experts of furnace gas in this country, having been engaged in the business for upwards of 16 years; and the value of his inventions and knowledge may be judged from the fact that his generators have already been adopted by most of the leading railways, iron and steel manufacturers, copper and brass smelters, glass manufacturers and boiler makers, foundry men, chemical manufacturers, sugar refiners, oil refiners, brewers, paper manufacturers, colliery owners, &c., &c., who have had erected upwards of 1000 generators.

The services of Mr. A. Wilson, M. Inst. M. E., have been secured as General Manager and Chief Engineer to the British Water Gas Syndicate, Limited; and this Company will have the benefit of his advice and assistance in all matters appertaining to their business for a term of five years.

The purchase price of water gas patents, rights, and all improvements thereof for the County of York, as owned by the British Water Gas Syndicate, Limited, and in accordance with the before-mentioned agreement, has been fixed at the sum of £101,000, payable as to £10,000 in cash, £10,000 in fully-paid up ordinary shares, and £1000 in 200 fully-paid up founders' shares of £5 each.

The following agreement has been entered into:—An agreement, dated the 8th day of April, 1889, between the British Water Gas Syndicate, Limited, of the first part, John Charles Cottam, of the second part, and Alfred Charles Dockerill, as trustee on behalf of the Company, of the other part.

Application will in due course be made to the London Stock Exchange for a quotation of the Company's shares.

If no allotment is made, the deposit paid on application will be returned in full.

Prospectuses and forms of application can be had at the bankers', brokers', solicitors', and at the Offices of the Company.

Application for shares may be made upon the form accompanying the prospectus, or by letter addressed to the Secretary, briefly stating the number of shares required, and accompanied by a remittance of 10s. per share.

Copies of the memorandum, Articles of Association, and agreement may be inspected at the Offices of the London Solicitors of the Company.

IMPERIAL CONTINENTAL GAS ASSOCIATION
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 7th day of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors a Dividend declared for the Half Year ended the 31st of December last, and the usual ordinary Business of such meeting transacted.

Notice is hereby also given that the Transfer Books will be closed from the 29rd inst. to the 7th of May next, both days inclusive.

By order of the Board,
R. S. GARDINER, Secretary.

30, Clement's Lane, Lombard Street,
London, E.C., April 15, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF AND SPRING WORKS
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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ANVILS, VICES,
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Special Derbyshire GANNISTER BRICKS.
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COKE BREAKERS,
FROM £14 EACH.
(THOMAS & SOMERVILLE'S PATENT.)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
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Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

CAST-IRON PIPES
FOR GAS AND WATER.
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FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
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GAS COAL.
POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12½ cwt. of good coke.
This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

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Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
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THE ONLY RELIABLE
DRY CENTRE-VALVE.
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
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1½ to 12 IN. BORE.

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CHANDLER'S PATENT.
SUITABLE FOR EVERY FORM OF LIGHTING.
A beautiful white light from ordinary Gas. Silent, steady, and economical.
PACKED IN BOX 9s., SUBJECT.
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SIXTH YEAR. Now Ready (Demy 8vo., Price 5s., or 5s. 6d. post free),
THE COMPLETE REPORTS OF THE PROCEEDINGS
OF THE VARIOUS
DISTRICT ASSOCIATIONS OF GAS MANAGERS
FOR 1888.
FORMING A COMPANION VOLUME TO T E TRANSACTIONS OF THE GAS INSTITUTE, WITH WHICH IT IS UNIFORM IN SIZE.
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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK,
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAYS
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

THE
LANEMARK COAL Co., LTD.,
Now offer their superior
GAS COALS

LANEMARK CANNEL.
Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
Coke per ton . . . . 1266·96 lbs.

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Yield of Gas per ton . . 11,879 cub. ft.
Illuminating Power . . 17·88 candles.
Coke per ton . . . . 1285·53 lbs.

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Yield of Gas per ton . . 10,734 cub. ft.
Illuminating Power . . 22·70 candles.
Coke per ton . . . . . 1320 lbs.

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Prices and Analysis of all the Scotch Cannels on application.

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TYNE BOGHEAD CANNEL.
Yield of Gas per ton . . . . . 13 155 cub. ft.
Illuminating Power . . . . . 38·22 candles
Coke per ton . . . . . 1,301·88 lbs.

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
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WOLVERHAMPTON.
PUMPS
FOR
STEAM AND OTHER POWER.

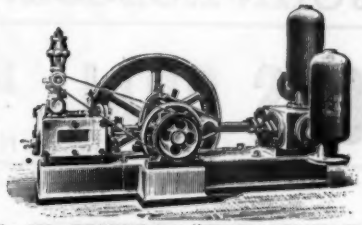
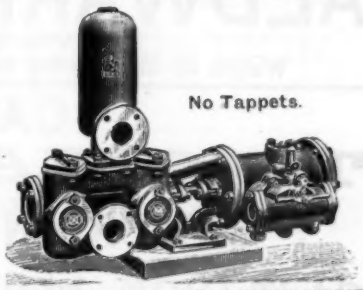


Fig. 685.—EVANS' Patent "RELIABLE" REVERSIBLE TAR and LIQUOR PUMP. In use everywhere. The Best in the World.



No Tappets.

Fig. 600.—EVANS' Patent "CORNISH" DIRECT-ACTING STEAM-PUMP. FOR EVERY PURPOSE.

SEE NEW CATALOGUE.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
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"LIGHT, Wenham Gas Lamps MORE LIGHT."

ITS ADVANTAGES ARE:
IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.
INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.
Absence of Downward Shadow. Practical Completeness of Combustion.
CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.
CAN BE USED AS VENTILATING LIGHTS, whereby the products are removed, and damage to decorations, &c., prevented.

SOLE PROPRIETORS AND MANUFACTURERS: **THE WENHAM COMPANY, LIMITED.**
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RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

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GAS COAL.

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REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,
NEAR BARNSLEY, SOUTH YORKSHIRE.

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ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.

Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

CAST-IRON PIPES, ETC.

THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

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MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM;

ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

SPECIALITIES.

THE "NUGENT"
RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED
RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

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JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795).

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

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Contracting Gas Engineers.

BEST MODERN APPARATUS SUITABLE FOR WORKS OF ANY SIZE QUICKLY SUPPLIED FROM S. C. & SONS', OR SPECIAL DESIGNS.

The "Perfect" Condenser.

MORRIS & CUTLER'S PATENT.

OVER

50

IN OPERATION.

EXTENSIVELY ADOPTED

BOTH IN

ENGLAND AND ABROAD.

THIS USEFUL ADJUNCT TO HYDRAULIC MAINS CONTINUES TO GIVE EXCELLENT RESULTS.

ILLUMINATING POWER OF GAS IS INCREASED.

MAIN IS KEPT FREE FROM TAR AND A UNIFORM LIGHT LIQUOR SEAL IS INSURED.

LIVESEY & TANNER'S DIFFERENTIAL TAR & LIQUOR OVERFLOWS.

TESTIMONIALS.

Croydon Commercial Gas and Coke Company,
Messrs. S. CUTLER & SONS. *May* 29, 1888.

GENTLEMEN,—In answer to your letter of the 26th inst., I am pleased to be able to say that I am so satisfied with the LIVESEY AND TANNER TAR OVERFLOWS which I have had in use during the past winter, that I have recommended their adoption throughout our retort-houses.

I am, yours faithfully, J. W. HELPS.

MESSRS. S. CUTLER & SONS. *Gas-Works, Tunbridge Wells, Feb.* 15, 1889.

GENTLEMEN,—In reply to your inquiry respecting LIVESEY AND TANNER'S TAR AND LIQUOR OVERFLOWS, I have much pleasure in saying that they continue to give every satisfaction.

A few months ago I had a very striking proof of their value. I started four Beds without the "Overflows," allowing the Tar to travel along with the Gas, when the illuminating power dropped a candle, and did not regain the loss until the "Overflows" had been put into operation. This experiment was repeated with the same result.

The apparatus requires but little attention; and if a small quantity of tar is run off regularly every morning, nothing further is required.—Yours faithfully,

ANDREW DOUGALL, Jun., Assoc. M. Inst. C.E.

PROVIDENCE IRON-WORKS,
MILLWALL, LONDON.

BELL'S ASBESTOLINE.

All kegs are labelled as above.

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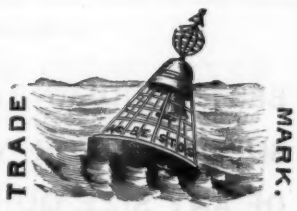
ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



BELL'S ASBESTOS.

CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

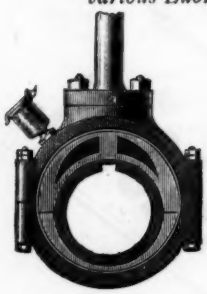
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

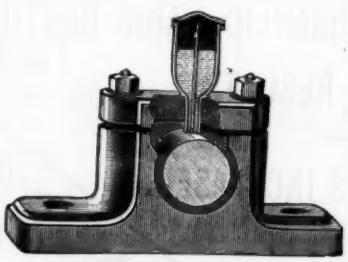
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

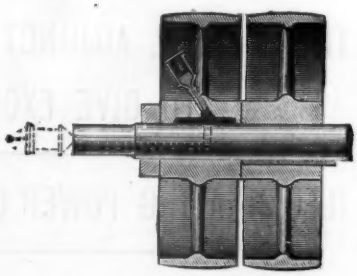
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point** is so high that it **lies beyond the range of Mercurial Thermometers**; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

Illustrated Priced Catalogue, with numerous Testimonials by Leading Firms, free on application.

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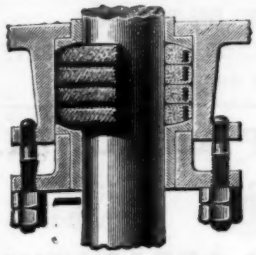
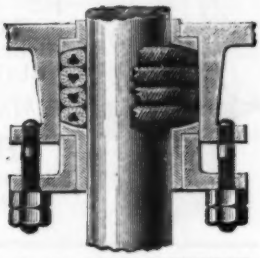
BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,498.



ROUND. SQUARE.



Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT, DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest type. The Packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

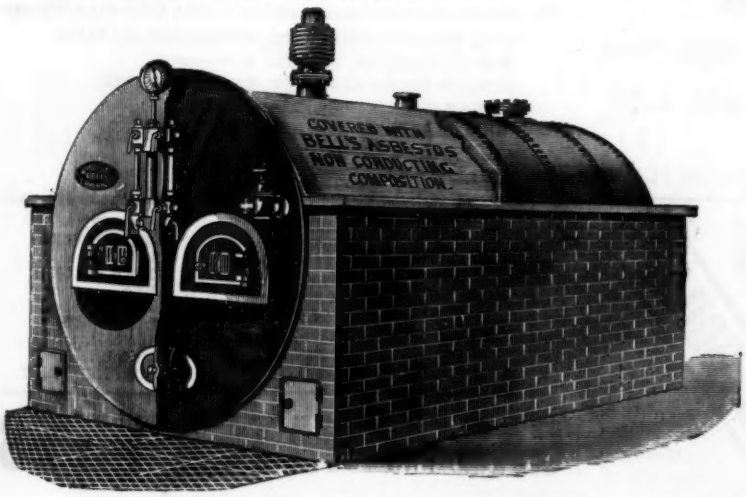
IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

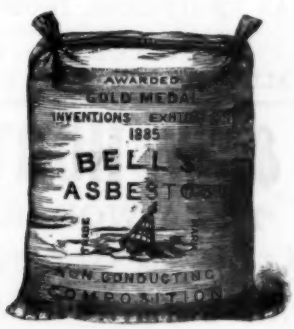
Price of either Section, 5s. 6d. per lb. Steam Vulcanized, 6s. 6d. per lb.

BELL'S ASBESTOS NON-CONDUCTING COMPOSITION,

FOR COVERING BOILERS AND STEAM-PIPES,

Will reduce loss by radiation to a minimum and save 40 per cent. of fuel.





Price **25**s. per Cwt.

Second Quality, 15s. per Cwt., is superior to the best sold by other Firms.

It is essential in covering that it shall not only be a non-conductor, but a substance free from whatever can injure metal, and of a nature which will enable it to adhere well for years. To do this it must be sufficiently elastic to prevent cracking and leaving, by expansion and contraction, the heated surfaces to which it is applied. This Composition is daily applied to Tanks with Round or Flat Bottoms, and its adhesive properties enable it to keep to the surfaces without bands or any device necessary for holding on other compositions. Our covering never fails to Save its Cost in a few months, lasts for years, after which it can be taken off and applied again with a little fresh. In all respects it is so superior as to be infinitely cheaper than Compositions sold at one-fourth the price. We would point out that this, being supplied dry in bag, will cover six times more surface than other materials which are sent out wet in cask. This shows the apparent low prices of other Compositions to be a sham.

For Export about one-third cost of freight is saved as compared with Compositions sent out in a wet state. In competition its never-failing efficiency has repeatedly proved it to be the cheapest material in the market for prevention of loss by radiation.

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NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER.
RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

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WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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MACHINE-MADE GAS-RETORTS.

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Gas Apparatus

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

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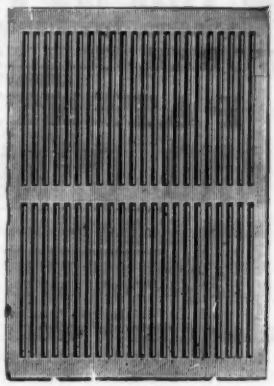

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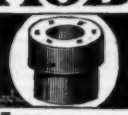

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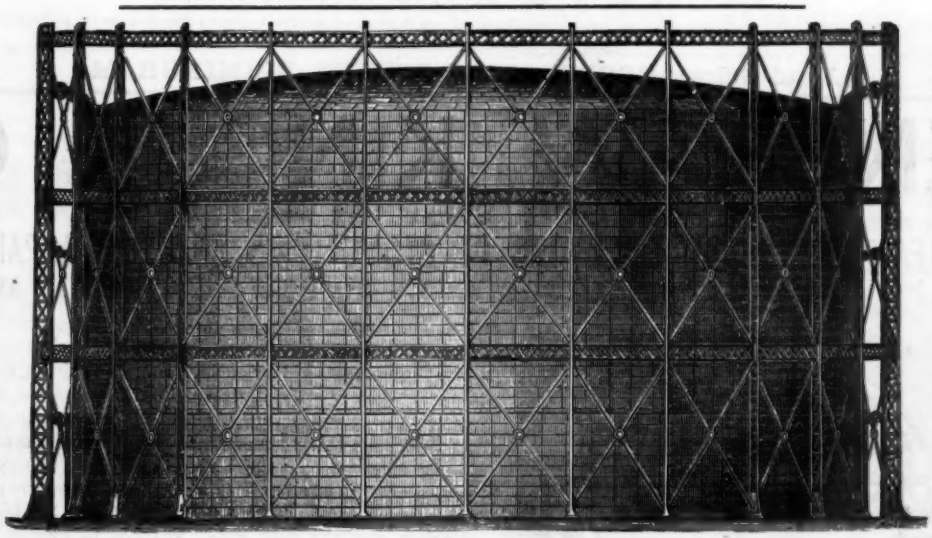

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